ANNUAL ADMINISTRATIVE REPORT (FY 2005) AND WORK PLAN (FY 2006) FOR INVENTORIES AND VITAL SIGNS MONITORING

FY 2005 -- FY 2006

SOUTHERN COLORADO PLATEAU NETWORK

Includes: Aztec Ruins National Monument (AZRU), Bandelier National Monument (BAND), Canyon De Chelly National Monument (CACH), Chaco Culture National Historical Park (CHCU), El Malpais National Monument (ELMA), El Morro National Monument (ELMO), Glen Canyon National Recreation Area (GLCA), Grand Canyon National Park (GRCA), Hubbell Trading Post National Historic Site (HUTR), Mesa Verde National Park (MEVE), Navajo National Monument (NAVA), Petrified Forest National Park (PEFO), Petroglyph National Monument (PETR), Rainbow Bridge National Monument (RABR), Salinas Pueblo Missions National Monument (SAPU), Sunset Crater Volcano National Monument (SUCR), Walnut Canyon National Monument (WACA), Wupatki National Monument (WUPA), and Yucca House National Monument (YUHO).

Southern Colorado Plateau Network Approval Signatures for FY 2005-FY 2006 Annual Report

Scott Travis, Superintendent, Canyon de Chelly National Monument Chair, Southern Colorado Plateau Network Board of Directors	Date
Paul Whitefield, Flagstaff Area Parks Chair, Southern Colorado Plateau Network Technical Advisory Committee	Date
Lisa Thomas, Program Manager Southern Colorado Plateau Network	Date
Bruce Bingham, Inventory and Monitoring Coordinator Intermountain Region	Date

AARWP Checklist

[Enter an X or 'Yes' in the first column after you have completed an item]

	Budget program (MS Access, aarwp_budget.mdb)
X	The income amounts entered for Biological Inventories, Vital Signs Monitoring, Prototype $$ - Annual Transfer, Water Quality Monitoring and other sources matches the dollar amounts from the memos sent to the regions/networks by WASO (have you used the correct income amounts?).
X	In the Add/Edit Budget Records form, the amount shown for Total Expenses matches that for Total Income. (If it doesn't, enter a record under Expenses in the 7_Other category to make it balance; use an entry such as 'Unexpended funds' or 'Overspent Funds' in the Description column to explain the amount.)
X	For all Expense records, the Description field includes the name of the university, agency, company, or other vendor to help us document our outsourcing efforts. (If this expense involved a contract, cooperative agreement, interagency agreement, or other partnership, is it clear where the money went?)
X	For all Expense records, the correct item from the picklist for 'Where $$ Went' has been entered. [Think about who the check was written to; e.g., enter 'Other Non-Federal' for funding that went directly to the private sector, such as for purchases (computers, supplies, etc.), travel (airlines, rental cars, hotels).]
X	On the Status of Biological Inventories form, there is one record for each inventory that is described in the text section of the AARWP or in the budget program. Be sure to list each park that was involved in the particular inventory.
X	Each year's budget has been exported as an .rtf file (one for FY 2005 and one for FY 2006), and both files have been inserted into MS Word at the end of the AARWP document.
X	The file aarwp_budget.mdb has been renamed to include the 4-character network alpha code and the years, as shown in this example: NCCN_FY0506_aarwp.mdb
	Annual Report and Work Plan (MS Word)
X	I have carefully read the guidance for the AARWP and followed it.
X	A header or footer with the date that the aarwp was last revised has been included.
X	I gave special attention to the 'Summary of Major Accomplishments' and 'Public Interest Highlights' sections of the report, following this years' guidance and example. (We need good examples of the successes, applications, and highlights of the program to help us obtain funding for all 32 networks! Your 'Summary of Major Accomplishments' section at the beginning of your annual report is what we'll use for the I&M Program's annual Report to Congress to justify the funding spent by your network.)
X	In the 'Status of Park Vital Signs Monitoring' table, all entries are equal to or greater than the entries in last year's report.
X	Photographs that might be included in one of the reports to Congress, brochures, websites, or other materials that help the program have been submitted by the network. (See the photo database and guidelines for submitting photographs.)
X	The aarwp file has been renamed using the network's 4-character alpha code and the years (FY0506) as in the example NCCN_ FY0506_aarwp.doc
	The annual report has been approved by the appropriate individuals, per my region's procedures. (If you cannot get electronic signatures, it is okay to submit a hard copy with signatures after November 4.)
X	I have followed my region's procedures for submitting the two files (e.g., NCCN_ FY0506_aarwp.doc and NCCN_ FY0506_aarwp.mdb). (Most regions require you to submit the files through the regional office. The files may be zipped into a zip file if desired, and then submitted to Steven Fancy via either email or ftp).
	Review of FY 2006 Work Plan by WASO
No	[Enter Yes or No]: Has the FY 2006 workplan been approved by the network Board of Directors, and therefore ready for the full WASO review? (If you enter No, the WASO I&M and WRD offices will only briefly review the work plan for 'red flags'.

Southern Colorado Plateau Network
Summary of Major Accomplishments and Public Interest Highlights for FY 2005

Southern Colorado Plateau Network **–** The SCPN is composed of 19 parks located throughout the diverse landscapes of northern Arizona, northwestern New Mexico, southwestern Colorado and southern Utah. Most of the park units lie within the southern Colorado Plateau ecoregion, but a few peripheral parks are allied with the Arizona-New Mexico Mountains and Southern Rocky Mountains ecoregions. The parks range in size from 14 to more than 500,000 hectares, with more than 750,000 hectares within the network designated or proposed as wilderness.

Biological Inventories

Final reports for mammal surveys were completed by the USGS Arid Lands Research Station at the University of New Mexico, for Aztec Ruins National Monument, El Morro National Monument, Petroglyph National Monument, Salinas Pueblo National Monument, and Yucca House National Monument. The inventory field studies resulted in identification of 50 species of mammals at the five parks, and review of museum specimens added an additional 11 species. The inventories also resulted in publication in a scientific journal of a range extension for the tawny-bellied cotton rat (*Sigmodon fulviventer*).

The USGS Arid Lands Research Station at the University of New Mexico also completed mammal surveys at an additional three SCPN park units and monuments. Overall, 70 species of mammals were documented for Bandelier National Monument, Chaco Culture National Historical Park, and El Malpaís National Monument.

Mammal inventories conducted by USGS Colorado Plateau Research Station at Northern Arizona University continued at two SCPN parks. Over the course of this inventory, investigators have compiled a significant amount of data on bat species occurrence at both Walnut Canyon National Monument and Wupatki National Monument. Significant new records of bats for Walnut Canyon include Allen's lapped-browed bat (*Idionycteris phyllotis*), big free-tailed bat (*Nyctinomops macrotis*), and Yuma myotis (*Myotis yumanensis*). At Wupatki, significant additions include spotted bat (*Euderma maculatum*) and big free-tailed bat, with new information on Townsend's big-eared bat (*Corynorhinus townsendii*).

FY 2005 marked the completion of reptile and amphibian inventories at 12 parks, the result of work by the USGS Colorado Plateau Research Station at Northern Arizona University. This taxonomic group was the least well known among the groups studied during the NPS biological inventories. Investigators found 50 amphibian and reptile species during fieldwork. Literature reviews, museum specimen data records, and personal communications with NPS staff added an additional eight species. During the inventories at SCPN parks, several important range extensions were documented. The western banded gecko (*Coleonyx variegatus*) was found for the first time in the Little Colorado River basin, and the mountain treefrog (*Hyla eximia*) was found for the first time in northern New Mexico. The reptile and amphibian inventories resulted in five publications in the *Herpetological Review* in 2004 and 2005.

Final reports for inventories of plants, mammals, and reptiles and amphibians were submitted to the SCPN by the Navajo Natural Heritage Program for three parks in the network. Canyon de Chelly National Monument, Hubbell Trading Post National Historical Site, and Navajo National Monument are surrounded by Navajo Nation lands. This year marks the fifth year that the SCPN has cooperated with the Navajo Natural Heritage Program (part of the Navajo Fish and Wildlife Department) on inventories and vegetation mapping. The Navajo Heritage program documented 13 reptile species and 6 amphibian species at Canyon de Chelly; a total of 8 reptile species and 3 amphibian species at Hubbell Trading Post; and a total of 10 reptile species and 5 amphibian species at Navajo. Overall, 58 new plant species were documented for Hubbell and Navajo.

USGS Colorado Plateau Research Station and Northern Arizona University ornithologists are compiling the results of inventories at Aztec Ruin National Monument, El Malpaís National Monument, El Morro National Monument, Petroglyph National Monument, Salinas Pueblo Missions National Monument, and Yucca House National Monument. Overall, 15 new bird species were added to those known to occur in the parks units.

A faculty member and graduate student from the Biology Department, Northern Arizona University, completed the plant inventory at Glen Canyon National Recreation Area, one of the largest parks in the network. Their work added 129 new taxa to the flora, including one new rare plant species, *Symphotrichum welshii*. The first occurrences of a highly invasive species, *Brassica tournefortii*, or Sahara mustard, were found during the inventory studies; the early detection has provided an opportunity for the park to take immediate action on preventing the species' further spread.

A private contractor has completed the draft final report for a survey of rare plant species and species of concern at Mesa Verde National Park. The results of intensive ground surveys in Mesa Verde National Park have provided information on the status and location of species of concern to the park (including some that were impacted by recent fires) and also have produced new locations of rare plants within the boundaries of the park. One of the species is ponderosa pine (*Pinus ponderosa*), which has been drastically reduced in range in the park due to recent fires. The study has provided information concerning the status of known occurrences of ponderosa pine, including an accurate count of surviving trees, specific locations of individual trees, measurements of height, diameter, shape, general condition, evidence of reproductive effort, and photographs of each tree.

Faculty from Prescott College and park staff completed the study documenting the presence, distribution, and abundance of exotic species at Chaco Culture National Historical Park. A University of Washington faculty member and park staff continued the study of potential links between groundwater characteristics and exotic plants at the park. A private contractor and park staff are continuing work on the presence, distribution, and abundance of rare species at Chaco. So far, a species of concern in New Mexico, *Aletes macdougalii*, a new species for Chaco, has been confirmed to exist and grow well on park land. The studies will provide guidance to park staff in management of species of special concern.

A Northern Arizona University staff member completed plant inventories at Yucca House National Monument. He has identified plants, prepared a species list, and is preparing a draft final report with SCPN staff.

A botanist from Northern Arizona University is revising the draft final report on plant inventory at Canyon de Chelly National Monument. The inventory study provided the research portion of his Master's degree. Two hundred and sixty nine previously unrecorded taxa including 70 new genera and 12 new families were documented for Canyon de Chelly National Monument from field work and review of herbaria specimens.

Completing vegetation maps for SCPN parks has been a high priority since the network was first formed. Vegetation maps that provide spatial distribution of vegetation types are useful as a form of inventory of vegetation present in the parks and as the basis for management plans, including fire, wildlife, and monitoring of natural resources. The map classifications are based on the National Vegetation Classification System (supported by NatureServe, the NPS and USGS, as well as other federal agencies), so that the results are comparable from park to park, both within and outside the network. The SCPN launched vegetation mapping at three parks and monuments, Canyon de Chelly National Monument, Mesa Verde National Park, and Petrified Forest National Park in FY 2003, and at Chaco Culture National Historical Park, El Malpaís National Monument, El Morro National Monument, and Hubbell Trading Post National Historical Site in FY 2004; work continued during FY 2005 at these eight parks. At Canyon de Chelly, the final vegetation classification is finished and the photo interpretation is complete; the draft map will be available for accuracy assessment in 2006. At Mesa Verde and Petrified Forest, fieldwork and draft final classifications are complete, and photo interpretation will be complete in early 2006. At the other five parks, fieldwork to support the development of the draft final vegetation classification began in FY 2005, and maps will be ready for accuracy assessment in FY 2007.

The network has worked with various partners to obtain accurate vegetation maps for the parks. Partners include Northern Arizona University, USGS Remote Sensing Division, USGS Colorado Plateau Research Station, USGS Fort Collins Science Center, the University of New Mexico, the Bureau of Reclamation, Prescott College, and the Navajo Natural Heritage Program. NatureServe, also one of the network partners, plays an important role in maintaining the National Vegetation Classification and works with us on evaluating and revising the classification based on new information derived from work at SCPN parks. The Northern Colorado Plateau Network (NCPN) is assisting the SCPN by working in the Orange Cliffs section of Glen Canyon National Recreation Area, as part of their work on a neighboring park. Data and analyses from vegetation sampling in SCPN parks (and from parks in the NCPN) are filling gaps in the knowledge of previously poorly understood vegetation types in the Colorado Plateau region.

The National Vegetation Mapping Program (a National Park Service and USGS partnership) has assisted the SCPN with vegetation mapping. The National Vegetation Mapping Program funded vegetation maps for the three Flagstaff parks and Bandelier National Monument prior to the inception of the SCPN; since the SCPN began, the national program has funded the vegetation map for El Malpaís National Monument, as well as provided part of the funding for other parks, including Canyon de Chelly National Monument and Chaco Culture National Historical Park.

Vital Signs Monitoring

The network continued to build a core permanent staff by hiring Steve Monroe to serve as the Water Resources Monitoring Leader. Formerly with USGS, Steve is a hydrologist with extensive experience in research and assessment of critical water issues in the western United States, with emphasis on the Colorado Plateau. One focus of his recent research has been the hydrology and ecology of springs in Grand Canyon National Park.

Data mining efforts in FY 2005 focused on building our spatial data library and locating park-specific information that is most relevant to the network's core vital signs. A database was developed for purposes of cataloging and organizing spatial data held by the network. With assistance from park GIS staff, the majority of relevant spatial data were compiled (current total: 2,750 datasets). Network staff and Northern Arizona University researchers visited park headquarters of all 19 parks to obtain documents and datasets relevant to core network vital signs. Documents were identified using the NatureBib online database, and park staff were interviewed to ensure completeness of target list. Documents were copied or scanned and inventoried in an in-house EndNote ™ database (current total: 1,398 park-specific records).

The network supported several inventory efforts that are necessary prerequisites to implementing vital signs monitoring. Network staff worked with Pete Biggam and NRCS to initiate soils mapping at Canyon de Chelly and Navajo National Monuments, and to assess existing soils maps at several Arizona parks. In conjunction with NCPN and Northern Arizona University, a springs inventory was completed for 79 spring sites across 27 NPS units. The springs inventory effort took a comprehensive approach, collecting data on site geomorphology, spring flow, water quality, vegetation, aquatic invertebrates, and terrestrial invertebrates.

SCPN and NCPN staff, in collaboration with university and USGS partners, continued protocol development work across several vital signs topics:

- Development of ***integrated upland monitoring protocols*** continued with Dr. Mark Miller, USGS, conducting field trials of vegetation and soils measures and measurement techniques across prominent upland Colorado Plateau ecosystems. One objective of the trials is to evaluate the repeatability, precision, and cost-effectiveness of proposed measurement techniques. USGS conducted related research on soil erosion by wind and water in support of the upland protocol.

- Collaborative work with NCPN and USGS scientists (Dr. Mike Scott and Dr. Anne Brasher) to develop ***riparian and aquatic macroinvertebrate*** protocols continued in FY 2005. Methods SOPs have been partially drafted. Riparian field trials focused on field application of a riparian classification system. Macroinvertebrate field trials focused on comparing quantitative and qualitative sampling, and on collecting multiple samples within the reference period.

- The ***land use/land cover and vegetation pattern*** project was initiated in collaboration with NCPN, Warren Cohen and Robert Kennedy (USDA Forest Service, Corvallis, OR) and Zhiqiang Yang (Department of Forest Science, Oregon State University). The purpose of the

project is to develop a set of methods and protocols that use remotely-sensed data to monitor and determine changes in land use/land cover and vegetation pattern, on and surrounding NPS lands on the Colorado Plateau. Planned pilot studies will focus on baseline mapping and change detection. Change agents of interest include grazing, prescribed fire, wildfire, woody tree/shrub die-off, recreation, and development.

- We continued collaborative efforts with Mike White (Utah State University), NCPN, and Brad Reed (USGS) to develop protocols for ***vegetation condition and disturbance patterns***. This year's work focused on collecting ground-based measures of vegetation greenness to explore the utility of using satellite data (MODIS NDVI data) to characterize seasonal trends in vegetation condition of grasslands, shrublands, and woodlands. Plot-based measures were collected every 8 days (from July to September) from several SCPN and NCPN parks. Corresponding MODIS NDVI data will be acquired and analyzed to investigate correlations in seasonal patterns of vegetation greenness and production.

- We also continued working with NCPN and USGS scientists (Brooks, Pavlovic, McEachern and Klinger) to develop ***early detection monitoring for invasive exotic plants***. FY 2005 work focused on developing a detailed literature review and study plan and compiling relevant spatial datasets.

Working with Northern Arizona University cooperators, planning is also underway for monitoring ***faunal groups as indicators of ecosystem integrity***. Matt Johnson and Jennifer Holmes have initiated protocol development for ***habitat-based bird community monitoring*** in SCPN parks. Initial products include a literature review of the conservation status of Colorado Plateau bird communities and populations, with pilot studies scheduled to begin in FY 2006. Neil Cobb completed a literature review to evaluate ***terrestrial arthropod groups*** as candidates for long-term monitoring and to assess their utility as indicators of ecosystem integrity.

Water Quality

The SCPN ***water quality monitoring program,*** funded by the NPS Water Resources Division, is fully integrated with the design and implementation of the network-based vital signs program. The draft Vital Signs Monitoring Plan, to be completed in December 2005, is a single, integrated monitoring plan that incorporates riparian vital signs, aquatic macroinvertebrates, and water quality components; it will include both pristine sites and sites with known water quality impairments.

In FY 2005 the first draft of a comprehensive water quality database for SCPN parks was produced under an interagency agreement with USGS. Data compilation consisted of retrieval of all electronically available water-quality data collected from sources at sites located within, adjacent to, and upstream of the 19 park units. The sources of data compiled and analyzed included Federal, State and Tribal agencies as well as volunteer monitoring organizations. Data analysis of the SCPN water quality database includes conducting quality-assurance; computation of summary statistics and comparison of the data to federal and state standards.

A Level 1 water-quality inventory of 57 key water bodies in 13 SCPN park units is in progress and will be completed in FY 2006. The project is a collaborative effort, carried out by the USGS Water

Resources Division and the network. The objective of this water-quality inventory is to obtain water-quality information for key water bodies in the parks. This information will be used to supplement historic data and to describe the current chemistry and quality of the waters, thus providing a set of current baseline information vital for long term monitoring.

Collaborative work with NCPN and USGS scientists (Drs. Mike Scott and Anne Brasher) to develop ***riparian and aquatic macroinvertebrate*** protocols continued in FY 2005. Protocol development is currently underway, and will address a continuum of riparian environments ranging from small headwater streams to large perennial rivers. Also considered are intermittent and ephemeral streams. These streams are important because of their dominance in the regional landscape as well as their importance to ecosystem dynamics of the larger, extra-regional perennial streams. Long-term monitoring efforts will be directed towards: 1) the physical processes that create and maintain riparian ecosystems, 2) streamside plant communities, and 3) aquatic macroinvertebrates. Methods SOPs have been partially drafted. One focus of riparian field trials is the application of a hierarchical, process-based stream classification system which is currently under development. When complete, the classification will be used to assess channel functional condition and potential response to natural or disturbance-related changes in sediment supply and stream discharge across a range of spatial scales. Macroinvertebrate field trials are focused on comparing quantitative and qualitative sampling, and on collecting multiple samples within the reference period.

Public Interest Highlights (SCPN 2005)

Colorado Plateau Springs Inventory Documents New Populations of Endemic Species and Adds New Species to Park Lists

(see photos: 107-110)

Most springs systems throughout the Southwest are diverted or developed for domestic and agricultural use. Springs in national park units represent some of the last remaining free-flowing water sources in the landscape, and they serve as refugia for a host of unusual plants and animals. The Southern and Northern Colorado Plateau Networks joined forces to conduct an inventory of 79 springs at 27 park units during the summer of 2005. Researchers are currently identifying specimens and analyzing data, but noteworthy findings are already being reported.

In GRCA alone, range extensions were recorded for the millipede (*Tylobolus utahensis*) and the roseate skimmer (*Orthemis ferruginea*), a dragonfly. Another dragonfly found during the inventory, the masked clubskimmer (*Brechmorhoga pertinax*, see photo), is known primarily from Central America, with the highly disjunct Grand Canyon populations possibly representing a new species. A new population of the endemic Arizona wetsalts tiger beetle (*Cicindela haemorrhagica arizonae*), found only at GRCA, was also recorded. Researchers expect to find more endemic species as they continue to process invertebrate collections from these unique, isolated environments.

Four new plant species were added to park records at Fossil Butte NM. Although none of the species are rare in Wyoming, three of the species; glandular willowherb (*Epilobium halleanum*),

sawatch knotweed (*Polygonum sawatchense*) and combleaf cinquefoil (*Potentilla pectinisecta*) were found at the limit of their elevational range. These populations may be especially sensitive to global climate change and can be monitored for expansions and contractions.

Water-Quality Inventory Underway in 13 Southern Colorado Plateau Network Parks

(see photos 104, 112, 113)

A Level 1 water-quality inventory of 57 key water bodies in 13 SCPN park units is in progress and will be completed in FY 2006. The project is a collaborative effort carried out by the USGS Water Resources Discipline and the network. The objective of this water-quality inventory is to obtain water-quality information for key water bodies in the parks. This information will be used to supplement historic data and to describe the current chemistry and quality of the waters, providing a set of current baseline information vital for long term monitoring. Specifically, these data will enable determination of trends and identification of future changes.

Key water bodies for Level 1 purposes are defined as those waters that are essential to the cultural, historical, or natural resource management themes of the unit or that provide habitats for threatened or endangered plants and animals. The basic chemical character and water-quality of the key water bodies will be described by measuring pH and other parameters in the field and by collecting water samples that are analyzed in USGS laboratories for a wide variety of selected water-quality parameters ranging from arsenic to calcium and selenium.

A wide variety of water body types are present in the SCPN, including rivers, streams, arroyos, springs, seeps, reservoirs, tinajas (pools), and wells. Representatives of each of these types are included in the inventory. The sampling schedule includes three visits to each site and is designed to encompass representative periods of flow characteristic of the southwest, including snow-melt runoff, summer base-flow, and runoff produced by monsoon thunderstorms. Many sites are extremely remote and require lengthy and rugged hikes to access. Coupled with unpredictable flow patterns common on the Colorado Plateau, this water quality sampling effort is unusually interesting and challenging.

Data from this project, when complete, will be used to inform the development of the SCPN I&M water quality monitoring plan, will be made available to park resource managers, and will be included in a formal USGS report.

Seventy-Year-Old Montane Forest Plots Resampled in Grand Canyon National Park

(see photo 111)

In FY 2004 and FY 2005 the SCPN partially funded an initiative to resample 70- year-old vegetation plots in Grand Canyon National Park (GRCA). These plots were established in 1935 by the NPS Branch of Forestry (BOF) as part of an effort to create an early vegetation map for GRCA. The BOF collected data from over 400 study plots, nearly half of which were in the coniferous forests located on the North and South Rims of the Park. Collection of quantitative vegetation data using standardized methods was unusual for that period in the 20th century;

therefore, this dataset is extremely rare and highly valuable. It provides an exciting opportunity to examine how southwestern coniferous forests have changed since the early 1900's.

Relocation of the plots was an arduous process; they had not been permanently marked and the only clues to their whereabouts were hand-drawn topographic maps and original raw data sheets. Researchers used these topographic maps to develop approximate coordinates, and then hiked to the approximate location and used vegetation details from the historic datasheets to pinpoint the precise plot location. Amazingly, nearly all 192 historic plots were identified, and the plots were then marked in several ways to allow them to be easily and precisely located in the future. Plots were sampled using a combination of 1935 sampling methods and modern techniques. Use of 1935 methods will allow researchers to make direct comparisons between historic and modern data. Additional modern methods were employed to provide necessary data for other efforts, such as the park vegetation map.

By resampling the 1935 plots using modern methods, researchers at GRCA expect not only to learn about the history of vegetation change in the park, but to provide necessary data for the development of a new park vegetation map, to enhance long-term monitoring of future vegetation changes, and to help shape the development of ecologically appropriate vegetation management practices.

Integrated Upland Monitoring Protocol Has Broad Utility Across Colorado Plateau

(see photo 105)

The NCPN and SCPN continue to work with Dr. Mark Miller, USGS, to develop integrated vegetation and soils monitoring protocols for upland ecosystems of the Colorado Plateau. Long-term monitoring of upland ecosystems represents a central component of our monitoring programs, and it is anticipated that information from plot-based upland monitoring also will be used in conjunction with other monitoring data sets to address integrated, cross-scale monitoring questions.

Progress in FY 2005 centered on conducting field trials to refine a suite of possible sampling techniques. Among other objectives, investigators evaluated the precision, repeatability, and cost-efficiency of alternative methods. A range of Colorado Plateau ecological sites were used in this effort. The results of this preliminary sampling will guide further development of the monitoring protocol.

The conceptual model report associated with this work is being used to support conservation planning on the Colorado Plateau by The Nature Conservancy and The Grand Canyon Trust. In addition, the literature review and study plan associated with the 2005 preliminary sampling effort has been used by the US Fish and Wildlife Service, the BLM and the Utah Division of Wildlife Resources to address monitoring needs associated with restoration of sagebrush ecosystems in Utah.

I. Overview and Objectives

Network Objectives for Biological Inventories:

1. Complete targeted field investigations to accomplish the documentation of 90% of vertebrate and vascular plant species in parks and monuments.
2. Continue to compile and evaluate existing species data for each park.
3. Integrate new data acquired during inventory into NPS databases.
4. Review, edit, publish, and distribute inventory reports; evaluate usefulness of inventory data for monitoring.

Network Objectives for Vital Signs Monitoring:

5. Establish and execute organizational structures and procedures for effective operation of the SCPN I&M Program.
6. Hire and retain professional staff to implement the network monitoring program and secure office space, facilities, and equipment to provide a safe, healthy, and productive work environment.
7. Develop and implement an integrated GIS and data management program.
8. Acquire and summarize information and concepts important for assessing park monitoring needs and developing network monitoring program.
9. Develop ecosystem conceptual models; identify and evaluate candidate vital signs for monitoring.
10. Develop and implement an approach for completing vegetation mapping and classification for network parks.
11. Identify and complete additional inventories to support monitoring program.
12. Incorporate NPS water quality component into monitoring planning.
13. Develop, test, and refine protocols for core network vital signs**.**
14. Develop generalized sampling designs and park or project-specific sampling designs to support the implementation of long-term monitoring, and the analysis and interpretation of resulting data.
15. Develop and maintain strategies and products to communicate information with park staffs, scientists, and others interested in the SCPN I&M program.

II. Accomplishments (FY 2005) and Scheduled Activities (FY 2006)

A. Biological Inventories

Objective 1. Complete targeted field investigations to accomplish the documentation of 90% of vertebrate and vascular plant species in parks and monuments.

Task 1.1 – Mammal surveys

Parks involved AZRU, BAND, CHCU, ELMA, ELMO, HUTR, NAVA, PETR, SAPU, WACA, WUPA, and YUHO

- FY 2005 Accomplishments: (1) Dr. Mike Bogan and his staff at the USGS Arid Lands Biological Research Station, University of New Mexico, Albuquerque, completed the final report for mammal inventories for AZRU, ELMO, PETR, SAPU, and YUHO. (2) Dr. Bogan and Keith Geluso completed the final report for mammal inventories for BAND, CHCU, and ELMA. (3) Mr. Charles Drost, USGS Southwest Science Research Center, in collaboration

with Northern Arizona University, is preparing the draft final report for field studies on small, medium, and large mammal species at WACA and WUPA. (3) Mr. David Mikesic, Navajo Natural Heritage Program, has completed the final report for mammal studies at NAVA and HUTR. (4) Inventory biologists cooperated with the SCPN data manager on databases and species lists for the parks.

- Scheduled FY 2006 Activities and Products: (1) Charles Drost and the USGS and NAU team will complete the draft final report for mammal studies at WACA and WUPA (2) Charles Drost and NAU biologists will continue to coordinate with SCPN staff on data fields, data entry, and museum records to produce current mammal species lists for WACA and WUPA. (3) Inventory biologists will make changes in remaining draft final reports recommended by SCPN and park staff and prepare reports for outside peer review.

Task 1.2 – Inventory of breeding, wintering, and migrating bird species

Parks involved: AZRU, CACH, ELMO, ELMA, HUTR, NAVA, PETR, SAPU, YUHO.

- FY 2005 Accomplishments: (1) NAU biologists are preparing the draft final reports on bird inventories for AZRU, ELMO, PETR, SAPU, ELMA and YUHO. (2) Navajo Nation biologists are preparing the draft final reports on bird inventories at CACH and HUTR. (3) Biologists coordinated with the network data manager on data fields and entry.
- Scheduled FY 2006 Activities and Products: (1) Navajo Nation biologists will complete draft final reports on bird inventories at CACH, HUTR, and NAVA. (2) NAU biologists will complete draft final reports for all parks inventoried from 2001-2004. (3) Inventory biologists will make changes in draft final reports recommended by SCPN and park staff and prepare reports for outside peer review.

Task 1.3 – Inventory of reptiles and amphibians

Parks involved: AZRU, ELMO, BAND, CACH, CHCU, ELMA, HUTR, NAVA, PETR, SAPU, WACA, WUPA, YUHO.

- FY 2005 Accomplishments: (1) Ms. Erika Nowak and Mr. Trevor Persons, principal investigators, and biological technicians from NAU and USGS Colorado Plateau Field Station, completed the draft final reports for AZRU, BAND, CHCU, ELMA, ELMO, SAPU, WACA, WUPA, and YUHO. (3) Mr. David Mikesic, Navajo Natural Heritage Program, completed the final reports on field studies at CACH, HUTR, and NAVA. (3) Biologists coordinated with the network data manager on preparing data on species for SCPN and NPS databases.
- Scheduled FY 2006 Activities and Products: (1) NAU biologists and biological technicians will revise and complete the final reports on all parks inventoried from 2001-2004. (2) NAU biologists will continue to work with the SCPN on databases and species lists for the parks.

Task 1.4 – Inventory of vascular plants

Parks involved: AZRU, BAND, CACH, CHCU, ELMO, GLCA, GRCA, HUTR, MEVE, NAVA, PETR, WUPA, YUHO.

- FY 2005 Accomplishments: (1) Dr. Tina Ayers and a graduate student, Mar Elise Hill, Biology Department, NAU, completed the plant inventory at GLCA; the results were used for a Master's thesis by Ms. Hill in 2005. (2) Lynn Moore of Durango, Colorado, completed the draft final report for a survey of rare plant species at MEVE. (3) Dr. Lisa Floyd-Hanna, Prescott College, and Brad Shattuck, CHCU, completed the documentation of the presence, distribution, and abundance of exotic species at the park. (4) Dr. Patricia Barlow-Irick, botanist, and Brad Shattuck completed work on the presence, distribution, and abundance of rare species at CHCU. (5) Glenn Rink, NAU, completed the inventory at YUHO, including

field studies that were extended for an additional year because of drought conditions in 2001 and 2002, identifying plants, and preparing a species list. (6) Dr. Elise Pendall, University of Washington, and Brad Shattuck conducted work on establishing a link between ground water characteristics and exotic plant species. (7) Daniela Roth, Navajo Natural Heritage Program, completed final reports for plant inventories at HUTR and NAVA. (8) Glenn Rink, NAU, has revised the draft final report on plant inventory at CACH. (9) Biologists coordinated data fields and data entry protocols with other biologists and network data manager.

- Scheduled FY 2006 Activities and Products: (1) Investigators are preparing draft final reports on plant inventories and related projects at AZRU, ELMO, GRCA, and YUHO. (2) Glenn Rink, NAU, will complete final report on CACH for outside peer review.

Task 1.5 – Work with other agencies and with academic institutions to provide opportunities for students to assist with inventory studies.

- FY 2005 Accomplishments: (1) Mar Elise Hill, a graduate student at the Biology Department, NAU, completed her Master's degree program in 2005. (2) We hope that students will be encouraged to continue their education in natural resources and to consider careers with the NPS.

Objective 2. Continue to compile and evaluate existing species data for each park.

Task 2.1 – Compile and evaluate existing data on vertebrates and vascular plants and enter them in a consistent format into NPSpecies, NatureBib, Dataset Catalog, and compatible inventory databases.

- FY 2005 Accomplishments. 1) NatureBib inventories finalized for BAND and GLCA and records were edited to standardize keywords and update location information. Library technician designed NatureBib training sessions, and two such sessions were held at CACH and MEVE. 2) To support the development of vital signs monitoring protocols, park data mining continued in FY 2005 (see task 8.1).
- Scheduled FY 2006 Activities and Products: 1) Additional NatureBib training sessions will be held at CHCU, GLCA, GRCA, MEVE, and PEFO.

Task 2.2 – Certification of NPSpecies database.

- FY 2005 Accomplishments: 1) A review of herbaria specimens at 6 SCPN parks was conducted through a CP-CESU agreement with NAU to update nomenclature and verify identifications. 2) Certification of existing NPSpecies data for herpetofauna at 3 parks and vascular plants at 2 parks was completed.
- Scheduled FY 2006 Activities and Products: 1) NPSpecies certification will be completed at parks for which no new inventories were conducted: birds -- (9 parks) and mammals -- (5 parks). Complete certification of vascular plants at parks with completed FY 2005 herbaria reviews. Complete review of herbaria specimens at 3 additional parks.

Objective 3. Integrate new data acquired during inventory into NPS databases.

Task 3.1 – Coordinate data entry and editing of existing data on vertebrates and vascular plants and for NPSpecies, NatureBib, Dataset Catalog, and tabular and spatial data from inventory studies.

- FY 2005 Accomplishments: Results of biological inventories where final reports, draft final reports, and/or final species lists were available were entered into NPSpecies and certified (Birds - 5 parks; Amphibians & reptiles - all parks; Mammals - 12 parks; Vascular plants - 4 parks). Final reports were entered into NatureBib and linked to the appropriate NPSpecies records. Tabular and spatial data are still being finalized.

- Scheduled FY 2006 Activities and Products: Compile, organize and ensure proper documentation of spatial data developed during biological inventories. Catalog final reports in NatureBib and link to NPSpecies records where appropriate. Enter new species records, information, and supporting evidence into NPSpecies and certify. Finalize, document, catalog, distribute, and archive inventory databases.

Objective 4 - Review, edit, publish and distribute inventory reports; evaluate usefulness of biological inventories to monitoring in SCPN parks.

Task 4.1 – Summarize inventory data from parks and monuments and place in the context of conditions and trends on the Colorado Plateau.

- FY 2005 Accomplishments: (1) Network staff reviewed 17 draft final inventory reports.
- Scheduled FY 2006 Activities and Products: Remaining draft final reports and associated products will be reviewed by network and park staff.

Task 4.2 – Distribute annual reports on inventories to park staff and other interested parties.

- FY 2005 Accomplishments: (1) Final reports from reptile and amphibian and mammal inventories have been posted on the SCPN website. (2) Final reports on mammal and reptile and amphibians have been distributed to the parks.
- Scheduled FY 2006 Activities and Products: (1) Final reports from additional reptile and amphibian, mammal, and plant inventories will be distributed to SCPN parks.

B. Vital Signs Monitoring

5) Establish and execute organizational structures and procedures for effective operation of the SCPN I&M Program.
6) Hire and retain professional staff to implement the network monitoring program and secure office space, facilities and equipment to provide a safe, healthy, and productive work environment.
7) Develop and implement an integrated GIS and data management program.
8) Acquire and summarize information and concepts important for assessing park monitoring needs and developing a network monitoring program.
9) Develop ecosystem conceptual models; identify and evaluate candidate vital signs for monitoring.
10) Develop and implement an approach for completing vegetation mapping and classification for network parks.
11) Conduct additional inventories needed to support development of monitoring program.
12) Incorporate NPS water quality component into monitoring planning.
13) Develop, test, and refine protocols for core network vital signs**.**
14) Develop generalized sampling designs and park- or project-specific sampling designs to support the implementation of long-term monitoring and the analysis and interpretation of resulting data.
15) Develop and maintain strategies and products to communicate information with park staffs, scientists, and others interested in the SCPN I&M program.

Objective 5 – Establish and execute organizational structures and procedures for effective operation of the SCPN I&M Program.

The SCPN formed a Board of Directors, Technical Advisory Committee and developed a network charter in FY 2002.

Task 5.1 – Conduct regular Board of Directors' meetings to ensure a smoothly functioning and coordinated network I&M program.

- FY 2005 Accomplishments: (1) The BOD held a meeting in December 2004 to consider the FY 2005 workplan and budget and to make staffing decisions.
- Scheduled FY 2006 Activities and Products: The BOD will hold an in-person meeting on November 3, 2005. They will hold conference calls as necessary to consider SCPN budgets, staffing proposals, and Phase III monitoring plan development.

Task 5.2 –Conduct regular Technical Advisory Committee meetings to ensure a smoothly functioning and coordinated I&M program.

- FY 2005 Accomplishments: The Technical Advisory Committee (TAC) held a November 2004 meeting to consider the FY 2005 workplan and budget, provide staffing recommendations, and consider monitoring plans and projects proposed for FY 2005.
- Scheduled FY 2006 Activities and Products: The Technical Advisory Committee will hold an in-person meeting on November 1 and 2 to consider the network workplan for FY 2006. Additional meetings and conference calls will be held as required through FY 2006.

Task 5.3 – Form a Science Advisory Committee (SAC) to provide technical recommendations to the BOD and assist with data gathering and scoping sessions.

- FY 2005 Accomplishments: We did not convene any meetings of the Science Advisory Committee (SAC) in FY 2005. They were provided review copies of the Phase II report and network newsletters.
- Scheduled FY 2006 Activities and Products: The network will seek continued review and comment by Science Advisory Committee on progress of protocol development work.

Task 5.4 – Maintain regular working relationships with the Northern Colorado Plateau Network (NCPN).

- FY 2005 Accomplishments: SCPN and NCPN pursued a coordinated strategy in FY 2005 to develop and implement vital signs monitoring across the Colorado Plateau. Through numerous e-mail dialogs, conference call discussions, and in-person meetings, the two groups stayed in communication throughout the year. The focus of coordinated work was on seven protocol development topics (Table 1).

Table 1. Coordinated SCPN/NCPN protocol development projects.

Protocol Development Project	**Principal Investigator(s)**	FY 2005 Funding Sources	FY 2006 Funding Sources
Land use/land cover and landscape pattern	Zhiquiang Yang (OSU), Warren Cohen, Robert Kennedy (USDA Forest Service; NPS leads are Chris Lauver & Steve Garman	SCPN: $62,502 NCPN: $62,443	SCPN: $62,500 NCPN: $62,500
Vegetation condition	Brad Reed (USGS Flagstaff, AZ) and Mike White (Utah State Univeristy); NPS leads are Chris Lauver & Steve Garman	----------	SCPN: tbd NCPN: tbd
Integrated upland monitoring (soil, vegetation)	Mark Miller (USGS/BRD-CRS); NPS leads are Lisa Thomas & Thom O'Dell (methods), Chris Lauver & Steve Garman (sampling design) Biological Soil Crust Guide	SCPN: $61,000 NCPN: $61,000 USGS: $77,000	SCPN: tbd NCPN: tbd USGS: $90,570 USGS: $77,890
Integrated riparian monitoring (stream flow,	Mike Scott (USGS/BRD); NPS leads are Lisa Thomas, Steve Monroe, and Steve	SCPN: $30,000 NCPN: $30,000	SCPN: tbd NCPN: tbd

channel geomorphology, riparian vegetation	Garman		USGS: $18,114
Spring inventory protocols & inventory	Abe Springer and Larry Stevens (Northern Arizona University); NPS leads are Lisa Thomas, Steve Monroe, and Angie Evenden	----------	----------
Aquatic macroinvertebrates	Anne Brasher, USGS/WRD Utah District Office; NPS leads are Lisa Thomas, Steve Monroe and Steve Garman	SCPN: $40,025 NCPN: $10,000 USGS: ----------	SCPN: tbd NCPN: tbd USGS: $54,342
Invasive exotic plants (early detection)	Matt Brooks, Kathyrn MacEachern, Noel Pavlovic (USGS/BRD), Robert Klinger; NPS leads are Thom O'Dell and Lisa Thomas	USGS: $56,243	USGS: $50,000

- Scheduled FY 2006 Activities and Products: SCPN staff, NCPN staff and cooperators will continue to work together toward protocol development as described in Table 1.

Objective 6 - Hire and retain professional staff to implement the network monitoring program and secure office space, facilities and equipment to provide a safe, healthy, and productive work environment.

Task 6.1 – Acquire consolidated office space for SCPN staff. The SCPN is presently scattered throughout several buildings. With increased staff, there is a need for more office space and to bring the staff together.

- FY 2005 Accomplishments: With assistance from Ron Hiebert, CP-CESU the network was successful in finding temporary, consolidated space in Peterson Hall, NAU campus for all staff members. The NAU/NPS collaborative agreement is still awaiting university signature. CP-CESU and network staff continued to participate in planning for the new Applied Research and Development building, which is scheduled to be completed late in 2006.
- Scheduled FY 2006 Activities and Products: CP-CESU and network staff will continue to participate in planning for anticipated space in Applied Research and Development building.

Task 6.2 – Develop and Implement Personnel Management Plan.

- FY 2005 Accomplishments: An operational Personnel Management Plan has been drafted and will be considered during fall TAC/BOD meeting.
- Scheduled FY 2006 Activities and Products: (1) TAC and BOD will consider staffing options during November TAC/BOD meeting.

Task 6.3 – Hire professional staff to develop SCPN monitoring program.

- FY 2005 Accomplishments: (1) Steve Monroe was hired as the permanent Water Resources Program Leader and entered the position in July 2005.
- Scheduled FY 2006 Activities and Products: (1) Pending decisions of TAC and BOD, additional network positions will be hired during FY 2006.

Objective 7 -- Develop and implement an integrated GIS and data management program.

Task 7.1 – Develop data management plan.

- FY 2005 Accomplishments: Developed SCPN specific data management framework. Participated in workgroup with other network data managers to work on selected chapters of data management plans. Drafted portions of SCPN data management plan.
- Scheduled FY 2006 Activities and Products: Complete SCPN data management plan, standard operating procedures, and guidelines.

Task 7.2 – Database support for network I&M activities and related park projects.

- FY 2005 Accomplishments: Adapted vegetation mapping database for CHCU vegetation mapping project and provided support to cooperators in its use. Designed and developed database and Pocket PC application for the Integrated Upland pilot project. Provided training and support to Upland field crew in use of Pocket PC application for collecting and entering data. Provided database and data summary support to Upland principal investigator to enable rapid data analysis. Provided database support to GRCA project to revisit 1930's era vegetation plot.
- FY 2006 Activities and Products: Finalize vegetation mapping databases by completing QA/QC and creating compliant metadata. Provide support to Upland principal investigator for data summary and analysis of 2005 field work data. Modify Upland database and Pocket PC application for second year of pilot study field work. Provide database development and data management support for protocol development and pilot projects.

Task 7.3 – Acquire and organize spatial data relevant to monitoring projects.

- FY 2005 Accomplishments: Created in-house database for purposes of cataloging and organizing spatial data held by the network. Collected all datasets relevant to vital signs monitoring from park GIS personnel and created records in in-house catalog. Updated missing metadata information for datasets where possible. Purchased new workstation for GIS storage and analysis and updated directory structure to facilitate organization and upkeep of spatial datasets. Park-specific datasets total 2750. Began process of converting older GIS datasets to datum NAD 83.
- FY 2006 Activities and Products: Continue process of converting all GIS data to datum NAD 83. Create spatial data and metadata from inventory datasets. Create spatial data to support pilot monitoring projects. Provide data to and act as the main contact for contractors working on pilot monitoring projects. Work with park GIS staff to ensure network has access to most current base data layers.

Objective 8 -- Acquire and summarize information, and concepts important for assessing park monitoring needs and developing network monitoring program.

Task 8.1 -- Summarize existing monitoring information and data.

- FY 2005 Accomplishments: In spring-summer 2005, data mining team visited park headquarters of all 19 parks to obtain documents and datasets relevant to first priority network vital signs. Topics included: integrated riparian systems (hydrology, geomorphology, vegetation); integrated upland systems (soil, hydrology, vegetation); land use/land cover and vegetation patterns; vegetation condition and disturbance patterns; spring, seep, and tinaja systems; aquatic macroinvertebrates; and invasive exotic plants. Documents were identified using the NatureBib online database, and park staff were interviewed to ensure completeness of target list. Documents were copied or scanned and entered into an in-house EndNote ™ database (currently 1,398 park-specific records). During each visit, park natural resource staff were also interviewed regarding relevant digital datasets. Staff reviewed documents and datasets collected and created topical summaries for each vital sign for each park. Summaries included a narrative review of resources and monitoring activities as well as an annotated bibliography of documents and datasets held by the SCPN. Summaries completed to date include 9 riparian, 11 upland, and 9 springs and seeps. These summaries were sent to network collaborators and park staff for review.

- FY 2006 Activities and Products. A second wave of park visits will take place to fill identified data gaps and to obtain second priority vital sign information. Second priority vital signs include habitat-based bird communities, terrestrial invertebrate groups, wildland values (night skies, soundscapes), and air quality and climate. Staff will continue to work on the completion of topical summaries.

Objective 9 -- Develop ecosystem conceptual models; identify and evaluate candidate vital signs for monitoring.

Task 9.1 – In cooperation with NCPN, develop planning framework and continue further conceptual model development.

- FY 2005 Accomplishments: Mike Scott, USGS-BRD riparian ecologist, and Anne Brasher, USGS-WRD aquatic ecologist completed a combined riparian/aquatic conceptual model report in FY 2005, through funding provided by both networks.
- Scheduled FY 2006 Activities and Products: 1) The final riparian/aquatic conceptual model report will be included with the SCPN Phase III report. This task will be completed in FY 2006.

Objective 10 – Develop and implement an approach for completing vegetation mapping and classification for network parks.

Vegetation maps are an important data layer needed for designing monitoring programs on the southern Colorado Plateau. They provide a background for biotic community and habitat analyses, fire management, watershed studies, development of understanding of ecosystem processes, and for other management and monitoring needs. Aerial photography that is acquired for use in developing vegetation maps also provides baseline information on park conditions that are best assessed from the air, including extent of plant communities on the landscape, stream channel changes, road and trail locations and conditions, as well as other characteristics. The SCPN has made a major funding commitment to vegetation mapping and is providing funding for the initial efforts; the network is following National Vegetation Mapping Program guidelines and standards, and seeks collaboration and assistance from related mapping programs in NPS and USGS.

Task 10.1 Acquire aerial photography and other imagery as needed.

- FY 2005 Accomplishments: (1) Aerial photography completed in FY 2004 was quality-checked, printed, and available for photo interpretation.
- Scheduled FY 2006 Activities and Products: (1) Aerial photographs will be sent to parks as photo interpretation for vegetation maps is completed.

Task 10.2 Develop agreements with collaborators for vegetation mapping in SCPN parks

- FY 2005 Accomplishments: (1) The SCPN launched vegetation mapping at three parks, CACH, MEVE, and PEFO in FY 2003, and at CHCU, ELMA, ELMO, HUTR, and NAVA in FY 2004; work continued during FY 2005 at the eight parks. (2) Through the Colorado Plateau Cooperative Ecosystem Studies Unit, the SCPN signed a continuation of the original cooperative agreement with Northern Arizona University for assistance in field studies, analyses of sampling data, review of photo interpretation, final vegetation classification, and field studies for accuracy assessment at CACH, MEVE, and PEFO. (3) The SCPN signed a continuation of the original interagency agreement with the USGS Fort Collins Science Center for automation of vegetation map products, to include assistance with photo interpretation at CACH and MEVE. (4) The SCPN developed and signed an agreement with the University of New Mexico to provide scanning and digitizing new aerial photos for

BAND. (4) The SCPN developed and signed a continuation of an existing agreement with the Bureau of Reclamation for vegetation maps of CHCU, ELMO, HUTR, and NAVA. (5) The network developed and signed agreements with Prescott College for vegetation sampling in support of classification at CHCU. (6) SCPN purchased data from the Navajo Natural Heritage Program on vegetation at NAVA. (7) Under a new umbrella agreement between the IMR and NatureServe, the SCPN developed and signed a task agreement for assistance with vegetation classifications for BAND, ELMA, CACH, MEVE, and PEFO.

- Scheduled FY 2006 Activities and Products: (1) The SCPN will review vegetation mapping needs for network parks and monuments and develop new or modify existing agreements to meet any needs.

Task 10.3 Implement vegetation mapping in SCPN parks.

- FY 2005 Accomplishments: (1) The USGS CPRS/NAU team completed vegetation sampling in support of the vegetation classification and photo interpretation at CACH. (2) Prescott College completed field sampling for vegetation classification at MEVE and initiated field sampling for vegetation classification at CHCU. (3) USGS CPRS/NAU and collaborators completed draft final vegetation classifications for CACH and MEVE. (4) USGS CPRS/NAU and SCPN continued photo interpretation for PEFO. (5) In collaboration with the BOR, SCPN conducted a multi-park scoping meeting involving park, SCPN, and NVMP staff, as well interested parties at HUTR for HUTR, ELMO, and NAVA. (6) The SCPN collaborated with the BOR and CHCU to set up a scoping meeting for vegetation mapping at CHCU.
- Scheduled FY 2006 Activities and Products: (1) Complete preliminary and final map for PEFO. (2) Conduct accuracy assessment at PEFO. (2) Complete photo interpretation, modeling, and preliminary maps of vegetation types at CACH and MEVE. (3) Integrate tree density data and community model into preliminary map of MEVE. (4) Complete fieldwork draft classifications, and preliminary vegetation maps for CHCU, ELMA, ELMO, HUTR, and NAVA.

Task 10.4 Seek collaboration and assistance from related programs within the NPS and the NVMP.

- FY 2005 Accomplishments: (1) The SCPN received funding ($212,700) from the NVMP to complete mapping at CHCU and MEVE and to assist BAND in acquiring scanned and digitized post-fire aerial photography.
- Scheduled FY 2006 Activities and Products: (1) Continue to seek opportunities for collaboration within the NPS, NVMP, and outside agencies, in vegetation mapping. (2) Seek assistance for GLCA, the remaining large park in the network without funding for completion of vegetation map; the SCPN funded aerial photography for the park in FY 2002, and the photography is completed and available for photo interpretation or other uses. (3) Assist GRCA in developing a viable plan for vegetation mapping.

Objective 11 – Conduct additional inventories needed to support development of monitoring program.

Task 11.1 – Develop soil mapping workplan for SCPN parks.

- FY 2005 Accomplishments: *(FY 2005: $45,000 from SCPN)* With Pete Biggam, developed Interagency Agreement with NRCS to initiate soil surveys for CACH and NAVA, assessments of existing soil surveys and ecological site descriptions for SCPN parks in Arizona, and to complete estimates for completion of digital mapping for those units which

have recent soil data.

- Scheduled FY 2006 Activities and Products: Continue working with Pete Biggam and NRCS to accomplish project goals.

Task 11.2 – Conduct spring and seep inventory.

- FY 2005 Accomplishments: (1) Cooperators Abe Springer and Larry Stevens, in conjunction with NPS staff, completed springs inventory protocols and datasheets for site description, invertebrate, vegetation, water quality, flow, and geomorphology measurements. (2) NAU research technicians completed springs related data and report syntheses for all SCPN units. Park staff, cooperators, and a NAU research technician compiled a list of possible springs to be inventories and selected 80 springs based on spring type, elevation, park coverage, and park priority. (3) A four person crew completed inventory work at 79 springs (36 in SCPN parks) in 27 national park units (15 in SCPN). The crew worked 63 field days, including travel time to and from the parks. Crew members made a sketch map of each spring based on geomorphic surface types, documented the site with photos, recorded the presence and types of disturbance apparent at the site, determined potential solar radiation, and recorded the presence of wildlife species. Terrestrial and aquatic invertebrates were collected using quantitative and qualitative techniques. A vegetation species list was made for the site, and cover for each species was estimated for each geomorphic surface type. Discharge and water quality parameters were measured, and water samples were collected for chemical analysis in the laboratory. UTMs were recorded using a GPS unit. The geologic unit, spring emergence environment, spring type, and spring channel were described. (4) Identification of unknown plant and invertebrate specimens was initiated. Chemical analyses of water quality samples were completed in the lab.
- Scheduled FY 2006 Activities and Products: (1) Unknown plant specimens will be identified and invertebrate specimens will be identified to the lowest taxonomic level possible before being sent out for expert identification. Plant and invertebrate voucher specimens will be appropriately preserved and cataloged to NPS standards. (2) Data entry will be completed and checked for errors. (3) A final report will be generated by cooperators Abe Springer and Larry Stevens including descriptions of each individual spring, summary statistics for the project, and recommendations for future long term monitoring efforts.

Task 11.3 – Support development of ecological assessment protocol.

- FY 2005 Accomplishments: NCPN identified assessment of ecosystem condition as a basis for developing ecosystem monitoring protocols. Condition assessment may be a component of the spatial sampling design for both networks. This work will be conducted as a cooperative project with Mark Miller, USGS/BRD – Colorado Plateau Research Station. A two-year pilot project at Canyonlands NP began in FY 2005.
- Scheduled FY 2006 Activities and Products: USGS/BRD pilot project at Canyonlands NP will continue in FY 2006.

Task 11.4 – Complete plant inventories at WUPA and GRCA.

- FY 2005 Accomplishments: 1) *(FY 2005: $18,000 from SCPN)* Beginning in 2004, NPS researchers initiated an inventory of forest vegetation in GRCA. This research focused on low to high elevation ponderosa pine forest, the most common forest type in the Park. In 2005, NPS researchers resampled 34 plots that were originally established in 1984. Use of the same basic protocols in 2004 and 2005 will enable synthesis to provide part of the data base needed for a new vegetation inventory, classification, and park map. In addition, the sampling protocols repeated sampling methodologies used in 1984, enabling quantitative

characterization of forest changes since 1984. Moreover, the 2005 sampling will provide a basis for future resampling of the 1984 plots to enhance long-term monitoring of forest changes. Under the supervision of Park researchers, volunteers from Italy and England participated in collecting data on forests in GRCA. The assistance of these volunteers was not only an educational experience for the volunteers, but also enabled more research to be completed within the project budget. 2) *(FY 2005: $4,978 from SCPN)* Field surveys were conducted at WUPA for two rare cacti -- *Pediocactus peeblesianus* var. *fickeiseniae* and *P. simpsonii*. In addition, walking surveys of invasive plants along 14 miles of the entrance road through WUPA and 3 miles of NPS right-of-way through adjacent lands were completed.

- Scheduled FY 2006 Activities and Products: 1) Planned future work for GRCA forest vegetation inventory includes completion of data entry and verification, data analysis, and preparation of scientific presentations and manuscripts to be submitted for publication in scientific journals. 2) Data entry and project reports will be completed for the WUPA project in FY 2006.

Objective 12 -- Incorporate NPS water quality component into monitoring planning. In FY 2005 the network hired a hydrologist to coordinate the aquatic and riparian resources monitoring program. The aquatic resources monitoring program includes water quality, aquatic macroinvertebrates and riparian ecosystem components.

Task 12.1 – Summarize existing water-quality information and data.

- FY 2005 Accomplishments: SCPN continued an agreement with the Colorado District of USGS-WRD (Principal Investigator: Kirby Wynn) to compile and summarize existing SCPN park water quality data in an Access database. USGS-WRD incorporated water-quality data pertinent to SCPN from the U.S. Environmental Protection Agency (USEPA) Legacy STOrage and RETrieval (STORET) and STORET X (modern STORET) databases, the USGS National Water Information System (NWIS) database, state databases and selected additional SCPN datasets into the Access database. This effort follows an earlier cooperative endeavor between the Colorado District and NCPN to develop the Access database and populate it with NCPN park water quality data. By extending USGS-WRD efforts to include SCPN parks, the resulting database and data synthesis will include water quality data across the entire Colorado Plateau. The cooperator has provided the database associated with the project, but is behind schedule in providing a draft report.
- Scheduled FY 2006 Activities and Products: (1) USGS-WRD is scheduled to complete a final data synthesis report and associated database products. (2) SCPN staff will review draft documents and the database and will work with the cooperator to ensure completion of the project. (2) SCPN staff will utilize the water quality database to evaluate status, threats, and trends for sites in and near network parks. (3) A SOP will be developed defining procedures to integrate new data collected by NPS and other agencies into the water quality database. (4) SCPN staff will co-author a report with USGS personnel presenting water quality data collected by USGS and NPS staff during 2005 as part of the SCPN Level One Water Quality Inventory. (4) SCPN staff will coordinate efforts incorporate existing water quality data currently not in STORET into the water quality database.

Task 12.2 – Identify management and scientific issues associated with park water resources.

- FY 2005 Accomplishments: (1) SCPN hydrologist/aquatic ecologist continued to meet with park staff to identify monitoring needs and visit park waters.
- Scheduled FY 2006 Activities and Products: (1) Results of USGS-WRD data synthesis will

be incorporated into further refinement of monitoring objectives and identification of stream-specific monitoring plans.

Task 12.3 – Develop conceptual models for water resources; identify and evaluate candidate vital signs for monitoring.

- FY 2005 Accomplishments: Conceptual models for water resources are fully integrated into the NCPN/SCPN conceptual model framework. Mike Scott, USGS-BRD riparian ecologist and Anne Brasher, USGS-WRD completed a literature review and conceptual model report for the NCPN and SCPN, which integrated riparian and aquatic ecosystems of the Colorado Plateau (Scott et al. 2005). This report is pertinent to riparian and aquatic systems well beyond those found in Colorado Plateau NPS units, and also should be of use to BLM and other resource managers in the region. These activities complete this task.

Task 12.4 – Preparation of the water-quality component of vital signs monitoring plan.

- FY 2005 Accomplishments: Upon entering on duty in July 2005, staff hydrologist Steve Monroe began visiting SCPN parks with significant water resources and meeting with park staff concerning water quality issues.
- Scheduled FY 2006 Activities and Products: Staff hydrologist will specify and prepare the water quality portion of the SCPN Phase III report.

Objective 13 -- Develop, test, and refine protocols for core network vital signs.

Task 13.1 -- Work toward development and testing of protocols for assessing and monitoring upland dryland and montane ecosystems.

- FY 2005 Accomplishments: (*FY 2005: total of $199,000 with $61,000 from SCPN*) Collaborative work with NCPN and Dr. Mark Miller (USGS-BRD, Southwest Biological Science Center) to develop integrated upland monitoring continued in FY 2005. (1) Dr. Miller reviewed literature concerning measures and measurement techniques pertinent to monitoring upland soils and vegetation, and prepared a detailed study plan for conducting field evaluations of measures and measurement techniques in several ecosystems. (3) Dr. Miller hired and trained a field team to collect data in grasslands, shrublands, woodlands, and forests in 3 SCPN parks and 4 NCPN parks. Field studies were conducted in three distinct phases. The purposes of the phases were to compare square and rectangular quadrats (Phase I), evaluate relationships between within-plot sub-sample size and variability (Phase II), and evaluate between-observer repeatability of measures obtained with different measurement techniques (Phase III). Sampling from all three phases will be used to develop preliminary among-site variance estimates for measures of upland ecosystem condition.
- Scheduled FY 2006 Activities and Products: *(FY 2006: Total to be determined, with $90,570 from USGS).* Collaborative work with NCPN and Dr. Mark Miller, USGS, to develop integrated upland protocols will continue in FY 2006. Work to be completed includes: (a) field evaluations for variance estimation. Sampling in 2005 emphasized dryland ecological sites (grasslands, woodlands, shrublands), with lesser effort devoted to forested sites. Additional sampling in dryland ecological sites will be conducted, but a greater emphasis will be placed on forest sites in 2006; (b) field verification of modified soils maps. Parks with available digital soil and ortho-imagery will be selected for this activity. NPS ecologists will develop the sampling design and general accuracy assessment procedures. USGS will sample and characterize soils following standard NRCS protocols, and will use hand-held computers with GPS and GIS capabilities during field sampling; and

(c) products. A synthesis report with recommendations for measures and measurement techniques to include in standard operating procedures (SOPs) for monitoring, and field sampling SOPs. The work associated with the soil-mapping effort will result in a peer-reviewed journal article co-authored by NPS and USGS. Data from variance-estimation sampling will be summarized in a USGS Open File Report.

Task 13.2 -- Work toward development and testing of protocols for assessing and monitoring riparian and aquatic ecosystems.

- FY 2005 Accomplishments: Collaborative work with NCPN and USGS scientists to develop riparian and aquatic macroinvertebrate protocols continued in FY 2005. (1) (*FY 2005: Total of $60,000 with $30,000 from SCPN*). Dr. Mike Scott, USGS-BRD riparian ecologist, partially drafted riparian monitoring protocols with emphasis on methods sections. Riparian field trials focused on field application of riparian classification system. (2) *(FY 2005: Total of $50,025 with $40,000 from SCPN).* Dr. Anne Brasher, USGS-WRD, partially drafted aquatic macroinvertebrate monitoring protocols with emphasis on methods sections. Macroinvertebrate field trials focused on comparing quantitative and qualitative sampling, and on collecting multiple samples within the reference period.
- Scheduled FY 2006 Activities and Products: Collaborative work with NCPN and USGS scientists to develop riparian and aquatic macroinvertebrate protocols will continue in FY 2006. (1) *(FY 2006 Funding: Total to be determined, with $18,114 from USGS)* Dr. Scott will continue developing and testing riparian monitoring protocols. FY 2006 work will focus on a) field trials to evaluate and refine established methods, b) pilot testing across a broader range of Colorado Plateau stream types, c) the development and refinement of geomorphic stream classification and site selection procedures, and d) revision of draft protocols based on above tasks. 2) *(FY 2006: Total to be determined, with $54,342 from USGS)* Dr. Brasher will continue developing and testing aquatic macroinvertebrate protocols. FY 2006 work will focus on a) field trials to evaluate and refine established methods, b) evaluating within-year variance by sampling at multiple times within the reference period, and c) revision of draft protocols based on above tasks.

Task 13.3 -- Work toward development and testing of protocols for assessing and monitoring water quality and aquatic ecosystems.

- FY 2005 Accomplishments: See Task 12.4
- Scheduled FY 2006 Activities and Products: Staff hydrologist will develop water quality monitoring plans and protocols based upon elements from the Federal Clean Water Act and the relevant state's Water Quality Management Plan. Specific tasks include: 1) Identify water resource inventory data gaps. 2) Work toward developing monitoring protocol and QA/QC plan according to servicewide standards. 3) Define goals for project planning, funding, logistics, and implementation. 4) Determine data management needs and protocols following servicewide water quality monitoring standards (e.g. EPA-STORET legacy system). 5) Complete selection of network water quality monitoring sites (index sites only). 6) Compile information on water bodies in the network that are thought to be both pristine and ecologically highly significant at the park or network scale and that may be considered for nomination for outstanding or special protection waters status.

Task 13.4 -- Work toward development and testing of protocols for assessing and monitoring spring, seep, and tinaja ecosystems.

- FY 2005 Accomplishments: (1) In collaboration with NCPN and Abe Springer/Larry Stevens of Northern Arizona University, further refined draft springs inventory protocols for use in

FY 2005 springs inventory.

- Scheduled FY 2006 Activities and Products: (1) Final springs inventory report and protocols are due in FY 2006. (2) NCPN and SCPN staff will begin assessing adequacy of inventory protocols for springs monitoring.

Task 13.5 -- Work toward development and testing of protocols for assessing and monitoring atmospheric and climate conditions.

- FY 2005 Accomplishments: Given John Gross' work toward developing a cooperative agreement with the Western Region Climate Center (WRCC), we have not developed a Colorado Plateau MOU or conducted an inventory or climate stations within SCPN.
- Scheduled FY 2006 Activities and Products: SCPN will work with John Gross and WRCC to complete an inventory of SCPN climate stations and begin an assessment of climate station coverage across SCPN parks.

Task 13.6 -- Work toward development and testing of protocols for assessing and monitoring landscape patterns.

- FY 2005 Accomplishments: 1) Continued collaborative effort with Mike White (Utah State University), NCPN, and Brad Reed (USGS) to collect and use ground-based measures of vegetation greenness to explore the utility of using satellite data (MODIS NDVI data) to characterize seasonal trends in vegetation condition of grasslands, shrublands, and woodlands. Plot-based measures of plant area index, green fractional cover, bare ground and/or rock cover, and budburst/senescence were collected every 8 days (from July to September) from PEFO and WUPA and several NCPN parks. Corresponding MODIS NDVI data will be acquired and analyzed to investigate correlations in seasonal patterns of vegetation greenness and production. 2) (*FY 2005: total of $124,945 with $62,502 from SCPN*). In collaboration with NCPN, funded a CESU agreement with Warren Cohen and Robert Kennedy (USDA Forest Service, Corvallis, OR) and Zhiqiang Yang (Department of Forest Science, Oregon State University) entitled "Determining viable methods to monitor landscape patterns in National Park Service units of the Northern and Southern Colorado Plateau Networks: project to support monitoring protocol development." The purpose of the project is to develop a set of methods and protocols that use remotely-sensed data to monitor and determine changes in land use/land cover, vegetation pattern, vegetation condition, and disturbance patterns on and surrounding NPS lands on the Colorado Plateau. Initial field and office meetings were held with the remote sensing team from Oregon to determine the scope of a planned literature and data set review, to discuss the outline and scope of the study plan, and to discuss the objectives and potential parks involved in a series of planned pilot studies. Planned pilot studies will focus on baseline mapping and change detection. For baseline mapping, the objectives are to: (a) determine the most effective means to map land cover within the greater park ecosystems of selected parks; (b) determine viable methods for continuous mapping of percent total vegetation cover and/or percent bare ground, and continuous mapping of canopy structure and/or age class for selected wooded ecosystems. The objectives of change detection are to design, test, and determine the best methods for detecting change within the greater park ecosystems of selected parks. Change agents of interest include grazing, prescribed fire, wildfire, woody tree/shrub die-off, recreation, and development.
- Scheduled FY 2006 Activities and Products: (1) Continue collaborative effort with Mike White, Brad Reed, and NCPN to test and validate the use of MODIS data to assess and monitor vegetation greenness and production at selected Colorado Plateau (CP) parks. (2)

(FY 2006: total of $125,00 with $62,500 from SCPN) Continue in cooperative effort with NCPN and the remote sensing team from Oregon to finalize the study plan and initiate pilot studies at selected CP parks. This multi-year project is scheduled for completion in 2008. Work to be conducted in 2006 includes ordering and preparing data for pilot studies, writing draft baseline mapping protocols, and initiating pilot studies. Work for 2007 includes completion of most tasks of pilot studies. Work scheduled for 2008 includes completion and review of pilot studies, and completion of final project report and protocols. (3) Continue discussions with Brad Reed (USGS, Flagstaff, AZ) and potentially fund an agreement to develop protocols to monitor vegetation phenology on and surrounding NPS lands with satellite (MODIS) data.

Task 13.7 -- Work toward development and testing of protocols for monitoring faunal groups as indicators of ecosystem integrity.

- FY 2005 Accomplishments: (1) *(FY 2005: $98,478)* Continued bird protocol development through a CP-CESU agreement through Northern Arizona University (Matthew Johnson and Jennifer Holmes). Initial products include report summarizing monitoring objectives and questions for habitat-based bird communities and a literature review of the conservation status of Colorado Plateau bird communities and populations. (2) Completed a literature review to evaluate terrestrial arthropod groups as candidates for long-term monitoring and to assess their utility as indicators of ecosystem integrity through a CP-CESU agreement with Northern Arizona University (Neil Cobb).
- Scheduled FY 2006 Activities and Products: 1) Will continue bird protocol development through agreement with NAU (Jennifer Holmes, Matthew Johnson). During FY 2006 cooperators will a) complete habitat-specific conceptual models, b) complete Sections 1, 2, and 3 of protocol, c) propose a pilot study plan to include analysis of existing data and field trials of monitoring methods, and d) implement some field trials.

Task 13.8 -- Work toward development and testing of protocols for early detection of invasive exotic plants .

- FY 2005 Accomplishments: *(FY 2005: $56,243 from USGS)* (1) Continued collaboration with NCPN and USGS-BRD scientists (Brooks, Pavlovic, McEachern and Klinger) to develop early detection monitoring for invasive exotic plants. FY 2005 work focused on developing a detailed literature review and study plan and compiling relevant spatial datasets.
- Scheduled FY 2006 Activities and Products: *(FY 2006: $50,000 from USGS)* (1) Will continue collaboration with NCPN and USGS-BRD to develop early detection monitoring for invasive exotic plants. FY 2006 work will focus on developing statistical models, validating those models using existing vegetation mapping data, and developing a plan for further validation that will rely on new field data.

Task 13.9 -- Work toward development and testing of protocols for assessing and monitoring wildland values.

- FY 2005 Accomplishments: (1) Developed draft sampling design for monitoring wildland values. The design includes sampling night sky condition and natural soundscape condition at independently selected index sites within parks that contain substantial wilderness or backcountry areas.
- Scheduled FY 2006 Activities and Products: (1) Work toward initiating protocol development for monitoring night sky condition with noted experts (e.g., Chad Moore, NPS),

including a review of the adequacy of existing protocols. (2) Work toward initiating protocol development for monitoring natural soundscape condition with noted experts (e.g., Skip Ambrose, NPS), including a review of the adequacy of existing protocols.

Objective 14 -- Develop generalized sampling designs and park or project-specific sampling designs to support the implementation of long-term monitoring, and the analysis and interpretation of resulting data.

Task 14.1 –Work toward synthesizing the information needed, including a literature review, to develop a generalized sampling design across the network.

- FY 2005 Accomplishments: Reviewed published literature related to long-term monitoring sampling designs.
- Scheduled FY 2006 Activities and Products: Continue review of literature related to monitoring sampling designs and data analysis, and review selected SCPN park data sets for possible inclusion in vital sign monitoring sampling designs.

Task 14.2 - Work with statisticians and relevant parties (including other NPS I&M networks) to assess and apply sampling designs that effectively meet the intended vital signs monitoring objectives.

- FY 2005 Accomplishments: Network ecologist and program manager attended a formal workshop on vital signs monitoring sample design and several informal meetings with NCPN and other network ecologists to discuss appropriate sampling design strategies, sampling objectives, methods of spatial allocation of sampling sites, and revisit designs.
- Scheduled FY 2006 Activities and Products: Continue discussions with statisticians and other network ecologists on the pros and cons of various approaches of sampling design, stratification, determination of spatial and temporal sampling allocations, and data analysis. Work to apply best available knowledge from these discussions to the SCPN sampling strategy.

Task 14.3 - Work toward developing park or project-specific sampling designs.

- FY 2005 Accomplishments: In collaboration with NCPN and other cooperators, developed project-specific sampling designs for three funded projects (related to monitoring upland soils and vegetation, aquatic and riparian habitats, and vegetation greenness).
- Scheduled FY 2006 Activities and Products: Continue to assess alternative sampling designs for selected existing or planned data from SCPN parks or SCPN-related projects for adequacy in terms of spatial dispersion, sampling frequency, stratification, and other design issues. Begin developing park-specific applications of project sampling designs.

Task 14.4 – Work toward developing Chapter on Sampling Design (Chapter 4) for Phase III Report.

- FY 2005 Accomplishments: Developed a draft SCPN Sampling Design Chapter for the Phase III Report that includes sections on the major schemes for collecting measurements on vital signs and potential stratification strategies for various monitoring components.
- Scheduled FY 2006 Activities and Products: Revise and complete a final sampling design chapter.

Objective 15 – Develop and maintain strategies and products to communicate information with park staffs, scientists and others interested in the SCPN I&M program.

Task 15.1 - Communicate progress toward developing monitoring program to SCPN park staffs.

- FY 2005 Accomplishments: (1) Produced January and July newsletters to describe inventory and protocol development projects that were underway in FY 2005.
- Scheduled FY 2006 Activities and Products: To be determined in conjunction with SCPN TAC and BOD.

III. Staffing

SCPN Inventory and Monitoring Program Staff:
Lisa Thomas, Program Manager (Permanent GS-408-13 Ecologist)
Nicole Tancreto, Data Manager (Permanent GS-401-11 Biologist)
Dr. Chris Lauver, Quantitative Ecologist (Permanent GS-408-12 Ecologist)
Steve Monroe, Hydrologist (Permanent GS-408-11/12)
Joan M. Harris, Program Support and Administrative Assistant
(Permanent, 1/2 time STF GS-303-7)
Dr. Anne Cully, Plant Ecologist (Term GS-408-12 Ecologist)
Marguerite Hendrie, Assistant Data Manager (Term GS-401-7/9)
Rande Ramsey-Cross, Library Technician (Term GS-1411-06)
Rebecca Harms, NAU Research Technician
Megan Swan, NAU Research Technician

SCPN Board of Directors:
Scott Travis, Superintendent, CACH, Chair
Kate Cannon, Deputy Superintendent, GRCA
Dennis Carruth, Superintendent, AZRU
Larry Wiese, Superintendent, MEVE
Palma Wilson, Superintendent, FLAG
Bruce Bingham, IMR I&M Coordinator
Ron Hiebert, CP-CESU Research Coordinator
Lisa Thomas, SCPN Program Manager
Paul Whitefield, Chair, SCPN Technical Advisory Committee

SCPN I&M Technical Advisory Committee:
Paul Whitefield, FLAG, Chair
Cole Crocker-Bedford, GRCA
Stephen Fettig and Brian Jacobs, BAND
Elaine Leslie, CACH
Mike Medrano, PETR
George San Miguel, MEVE
Brad Shattuck, CHCU
John Spence, GLCA
Pat Thompson, PEFO
Dr. Ron Hiebert, CP-CESU Research Coordinator
Nicole Tancreto, SCPN Data Manager
Lisa Thomas, SCPN Program Manager

SCPN Science Advisory Committee:
Dr. Craig Allen, USGS/ FCSC/ Jemez Mountains Field Station
Dr. Jim Gosz, Sevilleta LTER Program
Dr. Dave Lime, University of Minnesota, retired
Dr. Barry Noon, Colorado State University
Dr. Jack Schmidt, Utah State University
Dr. Tom Sisk, Northern Arizona

IV. Reports, Publications and Presentations

Presentations, 2001:

Nowak, E.M., T.B. Persons, S.C. Knox. "Initial results from herpetological inventories in southern Colorado Plateau National Parks", 6th Annual Colorado Plateau Biennial Conference, November 4-8, 2001, Northern Arizona University, Flagstaff, Arizona.

Johnson, M. "Initial results from avian inventories in the southern Colorado Plateau National Parks and Monuments", 6th Annual Colorado Plateau Biennial Conference, November 4-8, 2001. Northern Arizona University, Flagstaff, Arizona.

Cully, A.C. "Setting and meeting goals for biological inventory: Preliminary results on a sampling plan for plant inventories at two National monuments in the Colorado Plateau Region", 6th Annual Colorado Plateau Biennial Conference, November 4-8, 2001, Northern Arizona University, Flagstaff, Arizona.

Cully, A.C.. "The National Inventory and Monitoring Program". Symposium on Crossing Agency Boundaries. 6th Annual Colorado Plateau Biennial Conference, November 4-8, 2001, Northern Arizona University, Flagstaff, Arizona.

Presentations, 2002:

Cully, A.C.. "Part 1. Plant species diversity; Part 2. The National Park Service Inventory and Monitoring Program in the southern Colorado Plateau", Arizona Native Plant Society, June, 2002.

Presentations, 2003:

Johnson, M. In preparation. Avian inventories in the southern Colorado Plateau National Parks and Monuments. 7th Biennial Conference of Research on the Colorado Plateau, Flagstaff, AZ, November 2003.

Nowak, E.M. and T.B. Persons. In preparation. "Herpetological inventories in southern Colorado Plateau National Parks", 7th Biennial Conference of Research on the Colorado Plateau, Flagstaff, AZ, November 2003.

Reports, 2002:

Cully, A.C. 2002. Plant species inventory, Aztec Ruin National Monument, New Mexico, El Morro National Monument, New Mexico, Petroglyph National Monument, New Mexico, and Yucca House National Monument, Colorado. Annual Report, 2001. National Park Service, Southern Colorado Plateau Inventory and Monitoring Network, CPCESU, Box 5765, Northern Arizona University, Flagstaff, Arizona 86011.

Haymond, S., E.W. Valdez, and M.A. Bogan. 2002. Mammal inventories of the Southern Colorado Plateau Network Including: Aztec Ruins, Petroglyph, Salina Pueblo Missions and Yucca House National Monuments. Annual Report, FY 2001. U.S. Geological Survey, Midcontinent Ecological Science Center, Department of Biology, University of New Mexico. Albuquerque, New Mexico 87131.

Johnson, M.J. and M.A. Stuart. 2002. Initial results: 2002 avian inventory report for Southern Colorado Plateau National Parks: Aztec Ruins National Monument, El Malpaís National Monument, El Morro National Monument, Petroglyph National Monument, Salinas Pueblo Missions National Monument, Yucca House National Monument. Aztec Ruins National Monument, El Morro National Monument, Petroglyph National Monument, Salinas Pueblo Missions National Monument, Yucca House National Monument. USGS Biological Resources Division, Forest and Rangeland Ecosystem Science Center, Colorado Plateau Field Station, Flagstaff, Arizona.

Johnson, M.J. and M.A. Stuart. 2002. 2001 Avian inventory annual report for Southern Colorado Plateau national parks: Aztec Ruins National Monument, El Morro National Monument, Petroglyph National Monument, Salinas Pueblo Missions National Monument, Yucca House National Monument. USGS Biological Resources Division, Forest and Rangeland Ecosystem Science Center, Colorado Plateau Field Station, Flagstaff, Arizona.

Nowak, E., T. Persons, S. Knox, and A.J. Monatesti. 2002. Initial results from reptile and amphibian inventories on Southern Colorado Plateau national parks, September 13, 2002. Aztec Ruins National Monument, El Morro National Monument, Petroglyph National Monument, Salinas Pueblo Missions National Monument, Yucca House National Monument. USGS Biological Resources Division, Forest and Rangeland Ecosystem Science Center, Colorado Plateau Field Station, Flagstaff, Arizona 86011.

Nowak, E., T. Persons, and S. Knox. 2002. Results for first-year herpetofauna inventories of Southern Colorado Plateau national parks. USGS Biological Resources Division, Forest and Rangeland Ecosystem Science

Center, Colorado Plateau Field Station, Northern Arizona University, Flagstaff, Arizona 86011.

Rink, G. 2002. Floristic inventory of Canyon de Chelly National Monument: 2001 interim report. Department of Biology, Northern Arizona University, Flagstaff, Arizona 86011.

Roth, D. 2002. 2001 annual report for the first year of plant inventories at Hubbell Trading Post National Historic Site and Navajo National Monument, as part of the National Park Service Inventory and Monitoring Project for the Southern Colorado Plateau Network. Navajo Natural Heritage Program, Department of Fish and Wildlife, P.O. Box 1480, Window Rock, Arizona 86515.

Reports 2003:

Geluso, K., M. Bogan, and L. Harding. Mammal Inventories of Selected National Parklands in the Southern Colorado Plateau Network Including: Aztec ruins, Bandelier, Chaco Culture, el Malpais, El Morro, Petroglyph, Salinas Pueblo missions, and Yucca house: Preliminary Field Report for FY 2003. U.S. Geological Survey, Fort Collins Science Center, Arid Lands Field Station, Department of Biology, University of New Mexico, Albuquerque, NM 87131.

Johnson, M., and J. Moore. Southern Colorado Plateau Network: FY 2003 Avian Inventory Activities & FY 2004 Work Plan. USGS Colorado Plateau Field Station, Flagstaff, AZ. October 2003.

Johnson, M., J. Moore, and M. Stuart. 2001-03 Avian Inventory (Draft) Final Report for Southern Colorado Plateau National Parks: Aztec Ruins National Monument, El Malpais National Monument, El Morro NationalMonument, Petroglyph National Monument, Salinas Pueblo Missions National Monument, and Yucca House National Monument. USGS Colorado Plateau Field Station, Flagstaff, AZ. October 2003.

Mikesic, D. 2003-2004 Administrative Report and Work Plan – CACH, HUTR, NAVA. Navajo Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona 86515.

Rink, G. Floristic Inventory of Canyon de Chelly National Monument: 2003 Administrative Report. Biology Department, Northern Arizona University, Flagstaff, Arizona.

Reports 2004:

Bogan, M., Haymond, S., and E. Valdez. Final report: 2001-2003 mammalian inventory for five southern Colorado Plateau parks, Aztec Ruin National Monument, El Morro National Monument, Petroglyph National Monument, and Salinas Pueblo Missions National Monument. Draft final report. U.S. Geological Survey, Fort Collins Science Center, Arid Lands Field Station, Department of Biology, University of New Mexico, Albuquerque, NM 87131.

Hill, M., and T.Ayers. Inventory of the vascular plant flora of Glen Canyon National Recreation Area, Arizona. Deaver Herbarium, Department of Biology, Northern Arizona University, Flagstaff, Arizona.

Jacobs, B. Herbarium work at Bandelier National Monument. Annual report, 2004 activities. Bandelier National Monument, New Mexico.

Juarez-Cummings, N. Mapping distribution and control of 10 exotic plant species, Grand Canyon National Park. Annual report, 2004 activities. Grand Canyon National Park, Arizona.

Juarez-Cummings, N. and J.. Crawford. Sentry milk-vetch 2003-2004 monitoring report. Annual report, 2004 activities. Grand Canyon National Park, Arizona.

Larue, C. A summary of the 2003 bird inventories at Canyon de Chelly National Monument. Annual report. Navajo Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona 86515.

Mikesic, D. Inventory of amphibians and reptiles at Canyon de Chelly National Monument. Draft Final Report. Navajo Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona 86515.

Mikesic, D. Inventory of amphibians and reptiles at Hubbell Trading Post National Historic Site. Draft Final Report. Navajo Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona 86515.

Mikesic, D. Inventory of amphibians and reptiles at Navajo National Monument. Mikesic, D. Inventory of amphibians and reptiles at Hubbell Trading Post National Historic Site and Navajo National Monument. Draft Final Report. Navajo Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona 86515.

Moore, L. Sensitive species surveys: Inventory and monitoring flora in Mesa Verde National Park. Annual report, 2004 activities. Windom Floristics, Durango, Colorado.

Rink, G. Floristic inventory of Canyon de Chelly National Monument: Draft final report. Biology Department, Northern Arizona University, Flagstaff, Arizona.

Rink, G. Vascular flora of Yucca House National Monument and nearby Ismay Ranch lands, Montezuma County, Colorado. Annual report, 2004 activities. Southern Colorado Plateau Network, Northern Arizona University, Flagstaff, Arizona.

Roth, D. Vascular plant inventories at Hubbell Trading Post National Historic Site. Draft Final Report. Navajo Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona 86515.

Roth, D. Vascular plant inventories at Navajo National Monument. Draft Final Report. Navajo Heritage Program, Navajo Nation Department of Fish and Wildlife, Window Rock, Arizona 86515.

Vankat, J. Report on relocating and resampling 1935 vegetation plots, Grand Canyon National Park. Annual report, 2004 activities. Grand Canyon National Park, Arizona.

Presentations 2005:

Hansen, M. and K. Thomas. 2005. Where problems arise in vegetation classification: USGS-NPS vegetation mapping. Presentation at the George Wright Society. (Lisa, I can't remember where the meeting was and nobody put it into their opening slides; would you mind putting in or letting me know and I will do it?)

Hansen, M. and K. Thomas. 2005. Where problems arise in vegetation classification: USGS-NPS vegetation mapping. Presentation at the George Wright Society.

Mattson, D., C. Drost, E. Nowak, T. Persons, M. Johnson, and J. Holmes. 2005. Harvesting the lessons of inventorying biological resources: Thoughts on design from the Colorado Plateau. Presentation at the George Wright Society.

Nowak, E. and T. Persons. 2005. Challenges of inventorying herptofauna: Lessons from the Colorado Plateau. Presentation at the George Wright Society.

Theses and Publications 2005:

Ashe, V. In preparation. "Influence of bait on assessment of biodiversity and trap success of small mammals: Examination across food guilds in North America." Master's thesis, Auburn University, Georgia.

Ashe, V. In preparation. "Influence of bait on assessment of biodiversity and trap success of small mammals: Examination across food guilds in North America." Journal of Wildlife Management.

Bogan, M., K. Geluso, and L. Harding. In press. "Westward expansion of the tawny-bellied cotton rat (Sigmodon fulviventer) in west-central New Mexico." The Southwestern Naturalist.

Hill, M.E. 2005. Botanical inventory of Glen Canyon National Recreation Area. Master's thesis, Biology Department, Northern Arizona University, Flagstaff, Arizona.

Johnson, M. and J. Holmes. 2003. Considerations in avian inventory and monitoring in National parks of the Southwest. Presentation at the Colorado Biennial Conference, Northern Arizona University, Flagstaff, Arizona.

Monatesti, A.M., E.M. Nowak, and T. Persons. 2005. Range extension of Mountain Treefrogs (Hyla eximia) from El Malpaís National Monument, New Mexico. Herpetological Review 36(1): 74-75. [ELMA, first record for Cibola County and northern New Mexico]

Persons, T.B., and E.M. Nowak. 2004. Coleonyx variegatus geographic distribution. Herpetological Review 35(1): 81. [WUPA, new record for Little Colorado River basin]

Persons, T.B., and E.M. Nowak. 2005. Bufo punctatus geographic distribution. Herpetological Review 36(2): 198. [SAPU, new Torrance Co. record]

Persons, T.B., and E.M. Nowak. 2005. Phrynosoma modestum geographic distribution. Herpetological Review 36(1): 80. [SAPU, new Torrance Co. record]

Persons, T.B., and E.M. Nowak. 2005. Hypsiglena torquata geographic distribution. Herpetological Review 36(1): 82. [ELMO, new Cibola County record]

Rink. G. 2003. Vascular flora of Canyon de Chelly National Monument, Apache County, Arizona. Master's thesis, Biology Department, Northern Arizona University, Flagstaff, Arizona.

Rink. G. In preparation. Floristic inventory of Canyon de Chelly National Monument, Arizona. Arizona Academy of Sciences.

Rink, G. and A.C. Cully. In preparation. Floristic inventory of Yucca House National Monument and environs,

Montezuma County, Colorado.

V. Status of Park Vital Signs Monitoring

Nineteen parks within the Southern Colorado Plateau Network are in the planning process for vital signs monitoring. Protocol development is underway for most of the network's core vital signs. Several parks already have biological and physical system monitoring under way using other funding sources.

Table 1. Status of Monitoring in Southern Colorado Plateau Network Parks.

Southern Colorado Plateau Network FY 2003	Air Quality	Water Quality	Water Quantity	Geologic Resources	Plants	Animals	Landscape Characteristics
Planning and Design							
# parks monitoring w/ NRC funding	19	19	19	19	19	19	19
#parks monitoring w/ other funding	-	-	-	-	-	-	-
Protocols Implemented							
# parks monitoring w/ NRC funding	0	0	0	0	0	0	0
#parks monitoring w/ other funding	4	11	11	6	6	7	-
Analysis/Synthesis Available							
# parks monitoring w/ NRC funding	0	0	0	0	0	0	0
#parks monitoring w/ other funding	0	0	0	0	0	0	0

VI. USGS Protocol Development and Monitoring-Related Research Needs

- Integrated upland monitoring. Technical assistance is required to develop integrated monitoring protocols relating to vegetation composition and structure and soil stability and upland hydrologic condition.
- Integrated riparian and aquatic macroinvertebrate monitoring protocols. Stream flow and depth to groundwater, channel morphology and riparian vegetation are core SCPN vital signs, as are aquatic macroinvertebrate communities. Technical assistance is required to develop monitoring across a range of flow regimes and to address several management questions relating to riparian ecosystems.
- Invasive exotic plant monitoring. Providing early warning of new exotic invasions and predicting the distribution and spread of established populations are important monitoring objectives toward exotic species management. Technical assistance is required to develop efficient sampling designs to address these monitoring objectives and to develop and test predictive models relating to exotic invasion of Colorado Plateau ecosystems.
- Application of remote-sensing technologies to integrated monitoring of multiple vital signs. Technical assistance is required to assess approaches and to develop protocols for affordably monitoring changes in vegetation condition and disturbance patterns via analyses of remotely-sensed imagery.
- Ecological assessment of current condition. An essential step in setting monitoring priorities and distributing sampling efforts across landscapes is to assess the current condition and vulnerability of park ecosystems. Across the Colorado Plateau, terrestrial

ecosystems have been altered by a legacy of overgrazing and fire suppression. Aquatic systems have been affected by altered hydrology and severe exotic invasion. Technical assistance is required to design and implement ecological assessment of Colorado Plateau ecosystems including 1) rangeland, 2) pristine semi-arid sites, 3) forests/woodlands with fire, 4) riparian corridors.

VII. Budget

In FY 2005, the SCPN network received no additional funds from the Servicewide I&M program for biological inventories of vertebrates and vascular plants. The final year of fieldwork for 3 parks took place in FY 2005; final reports for 17 parks have been completed; draft final reports for 15 parks have been received and are in review by SCPN staff; draft final reports are in preparation for inventory work in 20 parks and monuments. Principal investigators for inventories came from the USGS Colorado Plateau Research Station and Arid Lands Research Station, Northern Arizona University, the Navajo Nation Heritage Program, and private individuals.

In FY 2005, the network was allocated $1,209,000 from the Servicewide I&M program for vital signs monitoring. Following subtraction of a NPS assessment, the network received $1,202,900 for monitoring. Monitoring funds were used to 1) fund network staff, 2) continue park data mining efforts and integration of data into NPS databases, 3) continue protocol development work in conjunction with the Northern Colorado Plateau Network (NCPN), 4) continue vegetation mapping within SCPN parks, and 5) fund other inventory efforts that will support implementation of the monitoring plan.

The network also was allocated $122,300 from NPS-Water Resources Division (WRD) to continue development of water quality monitoring for the network. Following subtraction of a NPS assessment, the network received $121,100 for water quality monitoring. The WRD funds were partially used to hire a water resources program leader for the network, and to continue protocol development work for water chemistry, aquatic macroinvertebrates and riparian ecosystems.

In FY 2005, the SCPN provided $292,000 to university and USGS cooperators to develop monitoring protocols relating to six monitoring topics (integrated upland, integrated riparian, aquatic macroinvertebrates, habitat-based bird communities, land use/land cover, and landscape pattern).

The network spent $106,500 in FY 2005 to complete inventories in support of the monitoring program. Projects included herbarium review for eight parks, support to Natural Resource Conservation Service (NRCS) for soil surveys in Arizona parks, and completion of plant inventories at WUPA and GRCA.

In FY 2005, the SCPN devoted $213,200 of its budget to vegetation mapping for eight SCPN park units. In addition, the National Vegetation Mapping Program (NVMP) provided the SCPN with $147,500 ($149,000 minus $1500 assessment) for vegetation mapping at CHCU, and $65,200 ($65,900 minus $700 assessment) for vegetation mapping at MEVE and to assist in

providing scanned and digitized post-fire aerial photography for BAND. Combined network and NVMP funding resulted in a total SCPN vegetation mapping budget of $425,936. Cooperators included Northern Arizona University; the University of New Mexico; USGS Colorado Plateau Research Station, Remote Mapping Division, Fort Collins Science Center; Bureau of Reclamation; Prescott College; Navajo Natural Heritage Program; New Mexico Natural Heritage Program and NatureServe. In past years, the NVMP funded vegetation maps for CACH, ELMA, SUCR, WACA, WUPA, and BAND. We are hopeful that NVMP will continue working with the staffs of GRCA and GLCA to develop plans for vegetation mapping in the two largest parks in the network.

The SCPN network has received in-kind support from Northern Arizona University in the form of office space, equipment, and office assistance. In FY 2004, we were assigned additional office space, and included as future tenants in the Applied Research and Development Building (scheduled for completion in December 2006). The Colorado Plateau Cooperative Ecosystems Studies Unit has assisted the SCPN Inventory and Monitoring Program by facilitating partnerships with other agencies and academic institutions, as well as negotiating reduced overhead rates (17.5%) for agreements with principal investigators located at universities.

We will continue to use monitoring funds to hire professional network staff and to seek scientific support of the monitoring program through cooperative and interagency agreements. We will also continue to work with the NCPN to cooperatively develop monitoring protocols to meet shared monitoring needs. We will continue to contribute network funding toward the completion of vegetation maps for SCPN parks and will seek funding assistance toward this objective from the NPS Vegetation Mapping and Firepro Programs.

Budget Summary

FY05 Admin Report Network: 15 Southern Colorado Plateau

Category: 1_Income

Description	$ Amount	$$ Source	Where $ Went	Comments
	$1,209,000.00	I&M - VS Monitoring $$		
	$122,300.00	WRD - WQ Monitoring		
Veg Map (CHCU)	$149,000.00	Veg. Mapping Program		
Veg Map (MEVE)	$61,100.00	Veg. Mapping Program		
Veg Map (BAND)	$4,800.00	Veg. Mapping Program		
Subtotal	*$1,546,200.00*			

Category: 2_Personnel

Description	$ Amount	$$ Source	Where $ Went	Comments
Program Manager	$100,749.00	I&M - VS Monitoring $$	NPS	
Data Manager	$69,189.00	I&M - VS Monitoring $$	NPS	
Hydrologist	$15,006.00	WRD - WQ Monitoring	NPS	
Quantitative Ecologist	$83,776.00	I&M - VS Monitoring $$	NPS	
Program Assistant	$29,493.00	I&M - VS Monitoring $$	NPS	
Plant Ecologist (Term)	$81,517.00	I&M - VS Monitoring $$	NPS	
Assistant Data Manager (Term)	$47,219.00	I&M - VS Monitoring $$	NPS	
Library Technician (Term)	$50,277.00	I&M - VS Monitoring $$	NPS	
GRCA Ecologist (Term)	$6,747.00	I&M - VS Monitoring $$	NPS	
Misc. Personnel Costs	$6,862.00	I&M - VS Monitoring $$	NPS	
Subtotal	*$490,835.00*			

Category: 3_Coop. Agreements

Description	$ Amount	$$ Source	Where $ Went	Comments
IA-USGS-BRD_Upland Protocol	$61,000.00	I&M - VS Monitoring $$	USGS	
PNWCESU-OSU_Landscape Protocol	$62,502.00	I&M - VS Monitoring $$	University-CESU	
IA-USGS-WR_Macroinvertebrate Protocol	$40,025.00	WRD - WQ Monitoring	USGS	

IA-USGS-BRD_Riparian Protocol	$30,000.00	WRD - WQ Monitoring	USGS
CPCESU-NAU_Bird Protocol	$98,478.00	I&M - VS Monitoring $$	University-CESU
CPCESU-NAU_Herbaria Review (7 park)	$30,935.00	I&M - VS Monitoring $$	University-CESU
IA-NRCS_Soil Surveys for CACH, NAVA	$45,000.00	I&M - VS Monitoring $$	Other Federal
CPCESU-NAU_SCPN Support Agreement	$125,000.00	I&M - VS Monitoring $$	University-CESU
CPCESU-NAU_SCPN Support Agreement	$20,000.00	WRD - WQ Monitoring	University-CESU
CA_NatureServe_VegMap_BAND,ELMA,SAPU	$83,493.00	I&M - VS Monitoring $$	Other non-Federal
CA-UNM_VegMap_BAND	$12,757.00	I&M - VS Monitoring $$	Univ_Non-CESU
IA_USGS-RemoteSensing_VegMap_CACH	$60,000.00	I&M - VS Monitoring $$	USGS
CPCESU-NAU_VegMap_CACH,MEVE,PEFO	$5,669.00	I&M - VS Monitoring $$	University-CESU
CPCESU-NAU_VegMap_CACH,MEVE,PEFO	$63,411.00	Veg. Mapping Program	University-CESU
IA_BOR_VegMap_CHCU,ELMO,HUTR,NAVA	$12,000.00	I&M - VS Monitoring $$	Other Federal
CA_PrescottCollege_VegMap_CHCU	$44,339.00	Veg. Mapping Program	Univ_Non-CESU
IA_BOR_VegMap_CHCU,ELMO,HUTR,NAVA	$104,950.00	Veg. Mapping Program	Other Federal
IA_USGS-RemoteSensing_VegMap_MEVE	$35,617.00	I&M - VS Monitoring $$	USGS
Subtotal	*$935,176.00*		

Category: 4_Contracts

Description	$ Amount	$$ Source	Where $ Went	Comments
Navajo Nation FWD --NAVA Veg Map Data	$3,700.00	I&M - VS Monitoring $$	Other non-Federal	
Jim McGrath -- CHCU Herbarium Review	$7,500.00	I&M - VS Monitoring $$	Other non-Federal	
Subtotal	*$11,200.00*			

Category: 5_Operations/Equipment

Description	$ Amount	$$ Source	Where $ Went	Comments
GSA Vehicle	$5,727.00	I&M - VS Monitoring $$	Other Federal	
Field Equipment	$7,268.00	WRD - WQ Monitoring	Other non-Federal	
Computer Hardware, Software	$7,453.00	WRD - WQ Monitoring	Other non-Federal	
Computer Hardware, Software	$3,159.00	I&M - VS Monitoring $$	Other non-Federal	
Field and Office Equipment	$2,188.00	I&M - VS Monitoring $$	Other non-Federal	
Facility Maintenance and Furniture	$2,719.00	I&M - VS Monitoring $$	Other non-Federal	
Supplies and Miscellaneous	$3,320.00	I&M - VS Monitoring $$	Other non-Federal	
Utilities	$3,054.00	I&M - VS Monitoring $$	Other non-Federal	
Subtotal	*$34,888.00*			

Category: 6_Travel

Description	$ Amount	$$ Source	Where $ Went	Comments
Staff and Cooperator Travel	$28,233.00	I&M - VS Monitoring $$	Other non-Federal	
Training	$2,738.00	I&M - VS Monitoring $$	Other non-Federal	
TAC and BOD Meetings	$1,145.00	I&M - VS Monitoring $$	Other non-Federal	
Subtotal	*$32,116.00*			

Category: 7_Other

Description	$ Amount	$$ Source	Where $ Went	Comments
1% IMR Assessment	$6,100.00	I&M - VS Monitoring $$	NPS	
1% IMR Assessment	$1,200.00	WRD - WQ Monitoring	NPS	
1%IMR Assessment	$2,200.00	Veg. Mapping Program	NPS	
WUPA Plant Inventory	$4,978.00	I&M - VS Monitoring $$	NPS	
GRCA Forest Inventory	$18,000.00	I&M - VS Monitoring $$	NPS	
Springs Inventory_GRCA River Trip	$5,500.00	I&M - VS Monitoring $$	NPS	
Unexpended Funds	$4,007.00	I&M - VS Monitoring $$	NPS	
Subtotal	*$41,985.00*			

Budget Analysis

Analysis of Expenses by Where $ Went

Funding Source	Total $$	NPS	USGS	Other Federal	Univ.-CESU	Univ_Non-CESU	Other non-Federal
I&M - VS Monitoring $$	$1,210,348	$514,414	$156,617	$62,727	$322,584	$12,757	$141,249
Veg. Mapping Program	$214,900	$2,200		$104,950	$63,411	$44,339	
WRD - WQ Monitoring	$120,952	$16,206	$70,025		$20,000		$14,721
Totals	$1,546,200	$532,820	$226,642	$167,677	$405,995	$57,096	$155,970

Analysis of Expenses by Category

Funding Source	Total $$	Personnel:	Coop Agree.	Contracts	Operations/Equip.	Travel	Other
I&M - VS Monitoring $$	$1,210,348	$475,829	$632,451	$11,200	$20,167	$32,116	$38,585
Veg. Mapping Program	$214,900		$212,700				$2,200
WRD - WQ Monitoring	$120,952	$15,006	$90,025		$14,721		$1,200
Totals	$1,546,200	$490,835	$935,176	$11,200	$34,888	$32,116	$41,985

Expense Totals By Category

Category	SubTotal	Percent
2_Personnel	$490,835	31.74%
3_Coop. Agreements	$935,176	60.48%
4_Contracts	$11,200	0.72%
5_Operations/Equipment	$34,888	2.26%
6_Travel	$32,116	2.08%
7_Other	$41,985	2.72%
	$1,546,200	

Budget Summary

FY06 Work Plan Network: 15 Southern Colorado Plateau

Category: 1_Income

Description	$ Amount	$$ Source	Where $ Went	Comments
	$1,209,000.00	I&M - VS Monitoring $$		
	$122,300.00	WRD - WQ Monitoring		
Subtotal	*$1,331,300.00*			

Category: 2_Personnel

Description	$ Amount	$$ Source	Where $ Went	Comments
Program Manager	$110,300.00	I&M - VS Monitoring $$		
Data Manager	$75,100.00	I&M - VS Monitoring $$		
Hydrologist	$70,400.00	WRD - WQ Monitoring		
Quantitative Ecologist	$90,000.00	I&M - VS Monitoring $$		
Program Assistant	$30,900.00	I&M - VS Monitoring $$		
Plant Ecologist (proposed; 4 mo)	$22,800.00	I&M - VS Monitoring $$		
GIS Specialist (proposed; 4 mo)	$18,800.00	I&M - VS Monitoring $$		
Plant Ecologist -Veg Map (term)	$95,600.00	I&M - VS Monitoring $$		
Library Technician (term)	$8,100.00	I&M - VS Monitoring $$		
Assistant Data Manager (term)	$58,200.00	I&M - VS Monitoring $$		
Potential PCS Move	$60,000.00	I&M - VS Monitoring $$		
Misc. Personnel Costs	$16,300.00	I&M - VS Monitoring $$		
Subtotal	*$656,500.00*			

Category: 3_Coop. Agreements

Description	$ Amount	$$ Source	Where $ Went	Comments
CP-CESU-NAU_SCPN Support Agreement	$150,000.00	I&M - VS Monitoring $$		
Monitoring Agreements - Water Resources	$50,700.00	WRD - WQ Monitoring		
Monitoring Agreements - All Topics	$174,300.00	I&M - VS Monitoring $$		

Inventory to Support Monitoring	$60,000.00	I&M - VS Monitoring $$
Vegetation Mapping Agreements - Network	$150,000.00	I&M - VS Monitoring $$
Subtotal	*$585,000.00*	

Category: 5_Operations/Equipment

Description	$ Amount	$$ Source	Where $ Went	Comments
Computer Hardware, Software, Service	$11,000.00	I&M - VS Monitoring $$		
Office/Field Equipment	$10,000.00	I&M - VS Monitoring $$		
Utilities	$3,500.00	I&M - VS Monitoring $$		
GSA Vehicle(s)	$10,000.00	I&M - VS Monitoring $$		
Facility Maintenance and Furniture	$2,500.00	I&M - VS Monitoring $$		
Supplies and Miscellaneous	$3,500.00	I&M - VS Monitoring $$		
Subtotal	*$40,500.00*			

Category: 6_Travel

Description	$ Amount	$$ Source	Where $ Went	Comments
Staff and Cooperator Travel	$33,000.00	I&M - VS Monitoring $$		
TAC and BOD Meetings	$3,000.00	I&M - VS Monitoring $$		
Professional Meetings and Conferences	$2,500.00	I&M - VS Monitoring $$		
Training	$3,500.00	I&M - VS Monitoring $$		
Subtotal	*$42,000.00*			

Category: 7_Other

Description	$ Amount	$$ Source	Where $ Went	Comments
Assessment (based on FY05)	$6,100.00	I&M - VS Monitoring $$		
Assessment (based on FY05)	$1,200.00	WRD - WQ Monitoring		
Subtotal	*$7,300.00*			

Budget Analysis

Analysis of Expenses by Where $ Went

Funding Source	Total $$	NPS	USGS	Other Federal	Univ.-CESU	Univ_Non-CESU	Other non-Federal
I&M - VS Monitoring $$	$1,209,000						
WRD - WQ Monitoring	$122,300						
Totals	$1,331,300						

Analysis of Expenses by Category

Funding Source	Total $$	Personnel:	Coop Agree.	Contracts	Operations/Equip.	Travel	Other
I&M - VS Monitoring $$	$1,209,000	$586,100	$534,300		$40,500	$42,000	$6,100
WRD - WQ Monitoring	$122,300	$70,400	$50,700				$1,200
Totals	$1,331,300	$656,500	$585,000		$40,500	$42,000	$7,300

Expense Totals By Category

Category	SubTotal	Percent
2_Personnel	$656,500	49.31%
3_Coop. Agreements	$585,000	43.94%
5_Operations/Equipment	$40,500	3.04%
6_Travel	$42,000	3.15%
7_Other	$7,300	0.55%
	$1,331,300	